Towards Sustainable Communities

Alternatives in a Low Carbon Path

Edited by
Walter Mendoza

Indian Network on Ethics and Climate Change

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Preface

In the course of relating to Climate Change for almost 15 years now, INECC has focused on communities in different eco-systems: how they are impacted, how they respond to these impacts, and how civil society can relate to the communities on this issue. There were quite a few attempts to bring in researchers and scientists to understand the local impacts of climate change.

What needs to be emphasised is that much of INECC's understanding of climate change has come in interacting with the communities; communities who have felt its impacts, much before the network could understand and articulate what climate change was all about at the grassroots level.

When the NAPCC came out in July 2007 we realized that we needed to have the voices of the community heard on this. Together with other civil society organizations, like Greenpeace, we focused on certain missions of the plan of direct relevance to the communities.

We also realized that what we had been promoting in the last 15-20 years, as an Alternative Paradigm of Development to counterbalance a centralized, globalised, super industralised process of manufacturing and providing goods and services, is very relevant to the climate change debate and action plans.

The initial focus of the coalition was on energy – INECC had developed a perspective, as well as practice, on Decentralised Energy Options (DEO) over more than 10 years by the time the NAPCC came out; and Greenpeace was working on the Energy scenario for India.

This coincided with a series of regional roundtables in different parts of India in 2008: Delhi, Mumbai, Guwahati, Chennai, Bhubaneshwar, Visakhapatnam, and Bengaluru. We decided not to have the National Meeting in Delhi in 2008, but to go to there in 2009, just before the Copenhagen Meeting – it would facilitate communities' voices to be heard just as the decision makers finalised strategies for Copenhagen.

This National Meeting, sponsored by FCFC, Forum of Collective Forms of Cooperation, and INECC took place in Visakhaptnam in November 2008. The theme was Peoples' Voices in the Domestic and International Climate Change Agenda. It focused not merely on the entitlements of people as victims

of disaster, but also on their capabilities in different eco-systems: mountainous, arid – semi-arid, forest, urban, and coastal.

In preparation for the Delhi Meeting of 2009, a series of consultations were held with civil society groups to join this INECC – FCFC promoted National Hearing on Climate Change. Centre for Education and Communication (CEC) and Wada Na Todo Abhiyan(WNTA) were the first ones to join a coalition for the event, together with Wateraid.

By this time we were focusing on the Water Mission and related issues. Finally, Oxfam joined this group in April 2009. It developed a programme of regional hearings to feed into the National Hearings, together with a focus on another eco-system – the flood plains, and on Agriculture.

Two other areas were of crucial importance to the marginalized communities from the various eco-systems – forests and health.

Given that we would all be converging in Delhi just before 2009 ended, we decided to bring out a document that crystallises the perspective of the marginalized in the crucial areas of water, energy, agriculture, forests and health. Sustainable economies and governance was a concern running across these sectors.

Hence, we approached experts, some of whom had accompanied the different processes that developed through the coalition that now has a name – Civil Society Coalition for Climate Justice and Equitable Development.

This book - Towards Sustainable Communities, Alternatives in a low carbon path, is an attempt to bring People's Voices to the Climate Change Debates and Action Plans, especially the NAPCC. This is only the beginning, part of a continuing effort to articulate a perspective, and provide diverse responses to the Government of India's NAPCC, and the programmes that flow from it.

We must acknowledge the contributions of the persons with vast experience in the field of alternative development to this initial draft of our perspective on a few of the missions of the NAPCC and on a few other issues such as health, and sustainable economies and governance; and to the resource agencies that support this work towards democratizing the debate and action plans on climate change.

This is only a beginning, there is a long way to go - there are many more sectors and missions to relate to; and we need to make concrete suggestions to convert perspectives into plans and programmes.

1. Quest for Sustainable Communities in an era of Rapid Climate Change

The Context of India

R. Sreedhar

Background

INDIA is a country of vast dimensions and presents a rare diversity of situations - people, flora, and fauna. Indian settlements, their psychocutural and biophysical conditions bear a strong imprint of their history. The historical past has a direct bearing on the current access to and control over its resources. Currently, abysmal levels of poverty, the near total break-down in the governance structures, an intense pressure to liberalize the access to her wealth and enable global interests, and the threatening pace of degradation of natural resources and portending implications of climate change provide for a state of flux as she enters the new millennia aiming to acquire greater space in the comity of nations.

Land is the most vital resource-base for any country to charter its course of development. Its use and ownership reflects the economic diversity within the country. The access to and control over land, and therefore the resources they contain, still continues to be highly inequitable. The promise of the Constitution of the Socialistic Secular Democratic Republic to create an egalitarian social order has remained rhetoric. The land reforms eagerly awaited with the independence, rapidly petered into a stony silence. Forests, Mineral resources and Built infrastructure are today owned and controlled by large monopolies. These inequities have reflected in the growing unrest among the society and today except for very small part of the country and only a few among her citizens are spared of the threat of violence in everyday life.

R. Sreedhar, Geologist, Executive Director of Environics Trust; Member - Indian Network on Ethics and Climate Change (INECC); Current Convenor of mines, minerals & PEOPLE (mm&P).

`India had been the earliest home of village communities, and for centuries and thousands of years these self-governing republics had maintained order and peace, and disputes in villages, even when anarchy was in the realm'[1].

The dominant view on land prevailing in the `village republics' was that it belonged to the Lord and the community was the custodian. However, from time immemorial various rulers devised ways to extract a share of their produce, which they used to meet their needs. These rulers also established a practice of recording rights so as to levy a proportional tax. These took the form of ownership rights, and then followed with title deeds and other such instruments that established the right to property. Simultaneously it became an instrument for acknowledging the hegemony of the ruler.

The British were the most extensive in formalizing such a rule and made the most intense use of such instruments. The stamp of permanence came with the land and forest settlements and they were, as the British called it, `Permanently Settled'. The irony of this *Permanent Settlement* was that it arose from stating `if we have any business at all in the East, it is to try and found something better than the old approved patterns of oriental despotisms, and give to India the chance at least of becoming a great independent and intelligent community'.

The Settlement of land and its relentless hold on the Indian people has today driven most of its poor population to the thresholds of survival. The mountain and tribal communities who did not envision land and natural resources as property that could be owned or vested with the State with title deeds and other complex instruments were totally deprived of the vast `access region' that they were managing. Half-a-Century of Independent governance has had very limited impact on the positive side of human development and it has barely, if at all, touched the needs of these isolated communities. The colonial Land Acquisition principles and even laws continue till this day!

Driving Forces and Pressures

Certain driving forces punctuate various periods in history. In the current period, the core driving forces, and the pressures they evoked, which have

[1]Economic History of India, Vol I as quoted by Gairola & Sreedhar,1999 in Peoles Forestry Management

influenced the current environmental and social conditions and processes of development are:

- Economic Liberalisation, Privatisation and Globalisation
- Political and Administrative Convenience and more recently
- Need for Adapting to Rapid Climate Change

The pressures arising from the core driving forces have been compounded by pressures of diverse and growing population, of lack of state finances, of the need to come into the mainstream of the so-called `development' process.

Economic liberalisation, Privatisation and Globalisation

In the current era of globalization and rapid transformations in the economy, particularly in the developing countries, there is an ongoing threat to the livelihood and survival of people who are dependent on the availability of natural resources and traditionally having the rights and control over these resources. Free market economies, rooted in the concept of individual profit and not community sustainability, not just disrupt such systems; they create new, inequitable and exploitative relationships between people and nature. They also create new systems of governance, distancing people from their natural resources and the governed from those who own and manage corporates. In the process, the rights of the communities are taken over by the corporates, including the right to make decisions related to natural resource use. Liberalization, in the context of the free market economy, was experienced by India as a state even under colonial rule. For the British, the concept of community control over resources was an anathema. After the Revenue Administration was taken over by the British, the Indian Forest Act, enacted in 1865, initiated a systematic control over people's rights. The forest resources were commercialized for colonial interest but with an avowed objective of scientific management and conservation. An important consequence of reservation of forests was that people could no more create settlements in areas that were ecologically suitable – areas with adequate water resources and forest resources, which people could harvest without depleting them. Instead, communities were forced to move to ecologically unsuitable areas, where in order to survive, they were forced to exhaust the natural resources. Rather than enabling people to conserve these resources, enclosures of the forest turned people into exploiters and the increasing population into a negative pressure on

the environment. In a situation where the wealth of the nation is sold and recorded to the revenue earned by the state, and there is constant pressure on the state to earn even more revenue, there is a deepening erosion of people's rights to natural resources. More often than not, these resources, which people are barred from using, are used by the state to generate further revenue, such as large capital--intensive projects including dams, large scale mines and power projects and exploitation of resources for industrial development. People's struggle for survival and upkeep of the sustenance base in the state continues from Monarchic and Imperialist days.

The wave of globalization and liberalization has clearly favored the large corporate sector to consolidate their hold over mega interventions and thus over the natural resource base. The nature of corporate controls are also a matter of concern as the complexity through which corporate ownership and control is exercised and the growing ability of the small segment of corporate speculators who alter the control of resources lends supports to the credence that in the market place, it is the profits that matter and not the long term health of the resource base.

The issue is even starker in the case of mining. In the absence of any clear statement of priorities of the country on the exploitation of the resources, corporations are devising new ways to grab the wealth of the nation for small short-term gains. The rapidity with which the global interests want to usurp these resources is reflected to the stock markets today. It is with the same rapidity that mining is devouring lands and livelihoods of many communities.

Such a process of enclosure of rights of rural and indigenous communities and the rapid transfer of the controls to the market forces is becoming the prime cause of poverty. There is growing concern that some communities may be getting into the vicious trap of "chronic poverty". The urgency with which the World Trade Organization (WTO) regime is being brought to bear upon local communities suggests that this round of exploitation and establishment of rights on control will go beyond the physical resources of the adivasis and other indigenous communities and encroach into their traditional knowledge base. Under such alarming circumstances, an appraisal of the rights and the *dejure* and *defacto* control over natural resources becomes imperative. In the post Independence era, even while the Constitution recognized people's rights to resources, in the name of `good' governance several of these rights continue to

be restricted, which has lead to regional and ethnic grievances and conflicts and progressive increase in the control of resources by the state.

The free market economy is therefore going to progressively shift the control of resources in larger and larger measure from the communities and the state to the market forces. The real effects are at least three fold:

- Denial or defeating the purpose of rights and egalitarian legislations, which are the hallmark of democracy
- Loss of control of the state in managing critical natural resources by transferring their management to corporates particularly the MNCs
- Progressive abstraction of the real value of natural resources based on global market speculation and cartels adding to consequent vulnerability of the local and larger economy.

Political and Administrative convenience

Systems of governance related to natural resource use best highlight the difference between uniformity and diversity. By its very nature, a centralized system of governance has to be uniform. Conventional administrative activity is repetitive – most governments think that there must be uniform processes across a region or state, primarily because they can just repeat themselves. Probably that is why precedence is an important aspect of our whole political and administrative functioning. In contrast, the local communities have been very diverse and have developed different mechanisms suited to local settlements for managing both their natural resources and their affairs. Prior to the reservation of forests, communities were free to choose their settlement, and for their basic use, they could use natural resources without anyone else's permission. Currently the local institutions, even if they are constitutionally sanctioned like the panchayat, are forced to operate in the uniformity decided upon by the centre, whether it is the state government, or progressively now, the central government. If we see over the last 50 years, there has been less devolution of powers from the centre to the state; rather what was on the state government's list, is now being transferred to the central government.

In the case of development, the centralized convenience-driven governance system has resulted in uniform development activities being introduced right

across the country, be it employment generation schemes, or conservation strategy plans, or even disaster mitigation plans, with the activities having little relevance to the diverse needs of diverse populations, and even less taking into account their diverse capabilities for managing their own affairs. This has led to the need for designing very large programmes for which the local financial and technical resources seem inadequate, and because of inflation of its overall costs, there has been a need to look for investments from outside the state or outside the country. Once in this debt cycle, the state has to be dependent on more and more and on larger and larger projects in order to sustain its own existence. The progressive centralization of the resource control and the concurrent growth in the dissonance among different states, regions and ethnic groups has forced the Indian union to decentralize. Decentralization has become a catchword over the last two decades. However over the decades the state governments themselves were robbed of their revenue mechanisms. Despite two decades of the Sarkaria Commission's recommendations, the states have been virtually constrained by lot of the programmes and policies of the Central Government with the result that there is only a small window for innovation at the state level.

The control of the state has not been achieved without costs to the people and the natural resource regime. The state control over resources has meant an exponential increase in management costs. It has also meant exploitation on a wider scale as the resources are for use everywhere and for "national economic purposes" rather than the specific utility for which local communities harvested these resources. It has already become obvious that most of these government conservation policies and projects, planned and control by the bureaucracy have ignored the close traditional linkages between the habitat and local population. In the last few decades, a considerable amount of land and forest resources throughout the region have been excluded from people's use in the name of biodiversity conservation - a chain of national parks, sanctuaries, biosphere reserves and other such means of protection have been created without any discussion or debate with the people affected. This has led to a situation where communities who are critically dependent upon the natural resources of an area for their survival, are often seen as law-breakers. While some effort is being made to create participatory frameworks, people's right in making crucial decisions is still a long way off.

The constitutional amendments brought about to transfer the power to manage local resources and ensure people's basic rights still remains only a potential

mechanism for the transfer of control to local communities. As the state government itself has very few revenue mechanisms, there is only token devolution further to the local bodies. The areas of business allocated to the local bodies are linked to direct programmes of the Central Government, which have become very complicated for management.

Further, the basic shift in the quality of community formation instigated by the electoral process is that these institutions remain as local political entities and do not form a coherent natural group. However there is a very little actual shift in the control by state and its sectoral instrumentalities, both over the political process at the level of the local communities and the natural and financial resources that exist in any region. While the control of the state was hoped to increase the quality of utilization of the resources, almost all natural resources, such as water, land and forests have degraded in quality and diminished in quantity. This degradation in quality and quantity is paving the way for private investors to take control over natural resources and totally alienate local communities, a trend that is being propounded by the new wave of liberalization. The market economy propounded and being put into practice is already transferring to private investors a very significant proportion of resource in the form of rights and privileges in various guises, control over the management of many public and private sectors through the stock market, giving rights to extraction of forest resources and making it easier for them to overlook several constitutional and legal provisions to ensure local participation.

These effects are being already noticed in some situations and the examples of the sudden collapse of the global economy that took the world by surprise are excellent precursors to the worsening condition of the developing countries. The interplay of the forces of development at various levels and scales is already forming a complex web that, unless they are assessed and comprehended from the local to the global level, the securing of a sustained livelihood for the growing numbers in the developing countries will remain a mirage. It is therefore timely that a critical appraisal is undertaken of the status of people's rights and the control they are able to exert over the use of natural resources in the region and to identify appropriate strategies for positive community response. The modern forces, which are displacing the local communities, adopt a plethora of tools to gain control. The progressive divisions of the local communities in the name of the religion, caste, political, economic and other social groupings are subtle measures to undermine their collective capabilities.

Concerns with conventional development models

The model of economic development adopted was given popular legitimacy by couching it in rhetoric that it was the only course available to lift India out of the shackles of poverty, deprivation and backwardness. It was assumed that this path would satisfy the basic needs of a wider group of people.

However, what we have witnessed is that throughout this period local systems of production and management were undermined. In some cases, as with the building of large dams, and mining activities or extensive deforestation, these local systems were destroyed altogether. Sustainable local economies collapsed under the demands of achieving aggregate economic growth.

The overall impact of these processes was that rather than redistributing and democratizing the control and use of natural resources, the demands of the market economy created greater centralisation. Distributive justice and political participation were practically by-passed in this process. Overwhelming evidence now suggests that massive socio-cultural and ecological costs are an integral part of an economic model that seeks its primary justification in the maximisation of production and profit, within the current economic and political power relations on the planet.

Environmental and Climate Justice movements have grown all over the world not just to protest against such 'development', but also to define an alternative model of development that respects democratic and decentralised decision-making and restores the access and control over productive natural resources to local communities. It is only through strategies that sustain and strengthen local economies and ecosystems can sustainable development be achieved. This therefore points not to tinkering around with the present system but a transformation that evolves out of holistic understanding of natural processes.

Need for adapting to rapid climate change

Climate change has emerged as one of the most hotly debated and significant issues of the current times. While this phenomenon affects temperature and

rainfall patterns across the world, some areas are being impacted more severely than others. While the impacts of climate change on the ecosystems like accelerated glacial melt and distorted rainfall patterns have been studied in depth, preparation to tackle these impacts, both at the national and state levels seem to lack vision and are generally based upon the same paradigm of unsustainable development that has brought this world to the current state of crisis. Much harder to grasp are most of the other consequences of global warming, and especially of the consequences of build-up of carbon dioxide in the atmosphere.

Short-term changes in that concentration are mostly affected by the carbon in the atmosphere itself - the carbon dissolved in the upper layers of the sea and the carbon in plants and animals on land. Until the Industrial Revolution, the exchanges among the three were more or less in equilibrium. But now the concentration of carbon dioxide in the atmosphere is higher than it has been for at least 365,000 years (some say 650,000), even though about half the CO2 produced in the past 200 years by burning fossil fuels and making cement has gone into the sea. As a result, the sea is 30 per cent more acidic than it would have been without man's new activities. Even more alarmingly, the processes now set in train cannot easily be stopped, let alone reversed. Though CO2 in the surface layer is readily exchanged with the atmosphere, the mixing of that water with deeper layers takes several hundred years, meaning the acidification at the top is there for the duration and "essentially irreversible"[2] during the lifetime of anyone alive.

The local and indigenous people may perhaps not able to articulate in the modern language of biodiversity and global conservation but are still replete with knowledge about the practical methods for long term conservation of these resources. Their centuries of sustenance in and around what are now being presented as areas that need protection, fending for themselves and managing their community needs of water, fuel, fodder, medicine are proof enough of their understanding of the habitat and the careful husbanding of the resources. This wisdom pleads for greater understanding and even acceptance of many of the traditional but sophisticated management systems.

People have developed sustainable systems for utilizing and maintaining natural resources. Communities, rather than individuals and governments,

[2] British Royal Society, 2005

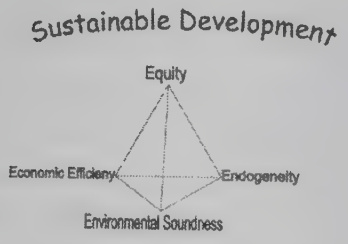
have been central to such systems. Principles of conservation and moderation rather than exploitation and profit have driven these systems.

The people of India were brave enough to resist their king and the mighty British Empire in order to keep local control of local resources such as forests, water resources particularly the springs and lakes. They continue to exhibit some of the finest traditions in conservation. The present condition is however very critical with a near complete break down of local institutional authority. Faced with a massive change in the environment that threatens survival itself, we witness a huge out-migration of work force and a `money-order' economy all across the country.

Sustainable Communities: Way Ahead

Environment is the sum of the internal and external biophysical and psychocultural conditions within the boundary we define. Given the complexity and diversity of the dynamic global and local environments, and the variety and complications of the evolutionary psychocultural conditions, Sustainable Development could be defined as the ***`set of processes that enables the local and global systems to be in ecological harmony'.***

The four non-orthogonal attributes of sustainable development, which are crucial to the state of being in ecological harmony, can be described in the form of the state of these attributes.

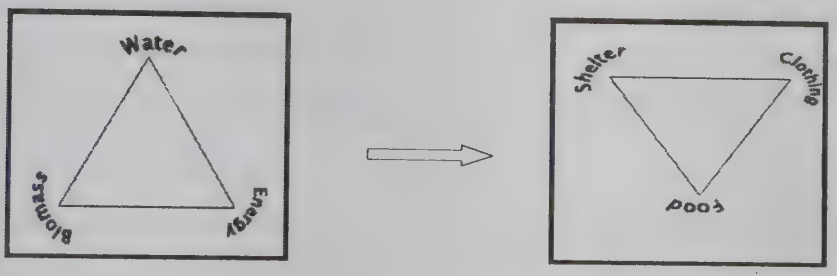


- Equity and Justice
- Environmental Soundness
- Endogeneity or Self Reliance
- Economic Efficiency.

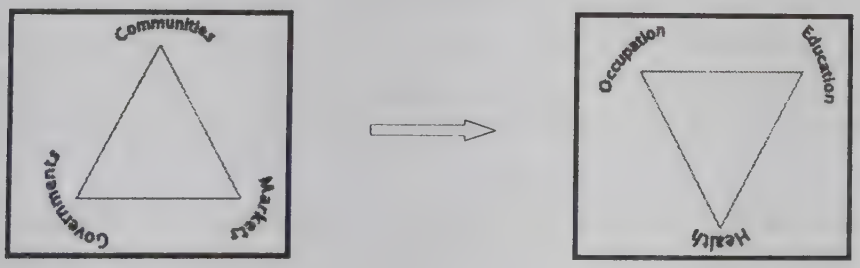
"Societies should identify, evolve processes and implement programmes that concurrently address these four attributes at whatever levels and scales the intervention takes place."

SUSTAINABLE DEVELOPMENT is practically an exercise of conserving existing harmonious options and generating more relevant alternatives.

The basic biophysical underpinning for any effort can be visualized as the triumvirate of biophysical resource potential of ***Water-Energy-Biomass.*** These loops must be closed at the smallest scale providing for the basic biophysical needs, expressed as the triumvirate of biophysical resource demands of a society, in the form of ***Food-Clothing-Shelter.***



The psychocultural environment presents the institutional resource potential in the form of the ***Government-Market-Communities.*** The primary charge of these institutions would be to meet the psychocultural demands of the society in the form of ***Health-Education-Occupation.***



The evolution of these systems and their mutual interaction particularly determine endogeneity (~ self-reliance) of a society to meet its developmental aspirations in a sustainable manner.

While at the biophysical level one could be a little more deterministic to state that more immediate and local the needs are met the more sustainable it is likely to be, it is much more complex to determine the levels and scales at which psychocultural needs must be met. The nation state has been a unit in articulating the demands and is overwhelmingly accepted as the scale at which these needs are addressed, despite exposures of the inability of nation states to

meet these needs in acceptable manner. This has resulted in a situation where societal governance has come to mean **`keeping discontent within manageable limits'** rather than a proactive process of **'creating conditions for life fulfilment.'**

The heightening discontent over several of these dimensions and the consequent struggle created a sense of togetherness in the various discontented communities. This has eroded the oneness which our freedom struggle had brought and yet stands as a monument of our current political compulsions.

- Introduction of governance measures for sustaining communities
- Making more effective use of resources without destroying the environment.
- Continued peace and harmony without the build up of vested interests.

Introduction of Sustainable Governance Measures

The Constitution of India guarantees a set of fundamental rights, which are legally inviolable. The Directive Principles of State Policy sets out clearly the need for equitable development and establishment of a welfare state. Further, the Constitution provides for the protection and honouring of the customary rights of different segments of the society. These provisions have been backed by appropriate legislations and specific court rulings have also upheld them.

Conventional approaches to development consider large solutions to be the only answer to problems. For instance, approaches addressing the shortage of power in the country automatically consider large-scale generation as the first and possibly only option. Urban Infrastructure requirements such as waste handling and disposal, water supply and sanitation are also approached in the same manner. There is a strong orientation towards the large-scale creation of centralized infrastructure for all situations.

Centralized approaches have however largely failed to provide access to infrastructure services at the last mile or address the 'tail enders' woes'. For instance, 80,000 villages in India are yet to receive electricity and of the 'electrified' villages, only 31% households have power in their houses. This coupled with the long gestation period, high costs, environment and social issues and time and cost overruns have raised issues about the relevance and viability of this approach for all situations.

There is also the urgent need for ensuring that development impacts reach the 'last mile' to directly benefit the community at large. Thus the case exists for considering complementary, more locally focused approaches to development based on principles of sustainability as an alternative to conventional centralized development.

Make conscious attempt to bring about convergence of various sectoral plans

Conservation of natural resources and management of the economy will need placing environment and the community at the centre of planning in each sector. At the local level, the Agro-Climatic Planning Process can enable this convergence. This needs to be reflected at all levels of planning and prioritizing of activities. The following are some examples of how this could be done.

Institutionalise Agro-Climatic Community Planning and Implementation Systems

Given the need for diverse responses at the local level to meet the diverse local ecological conditions, the local communities need to be truly empowered to plan and execute development activities. The resource potential and the specific interventions that would enable them to make optimum use of the natural resources to generate local income and employment and meet basic needs need to be identified and the specific inputs such as finances, technologies, and skills needed to realize these plans must be ensured. This could function as the core and to converge the existing different sectoral allocations and resources that could be accessed. The concepts underlying the Process have the greatest potential for systematically addressing several problems in the country.

Evolve Assessment Methods and Make Information Public

The government must regularly publish the basis of its allocation and the actual resources available to enhance people's participation and contribution. This will also ensure that the process stays decentralized. Such a disclosure by the government will foster better institution building at the local level and also help the government reflect the perspective of the people in its allocations.

Make more effective use of resources without destroying the environment

Shift the Idiom for Economic Activities

The revenue basket of any society could be comprised of several components and conscious attempt must be made to evolve an economy by making an effective use of resources. A number of new initiatives are called for, and the state has been attempting some of these already.

COMMUNITIES HAVE SEVERAL OPTIONS FOR ECONOMIC ACTIVITY	EXAMPLES OF ACTIVITIES	CONCURRENT IDIOMS OF PROCESS
IDEAS AND KNOWLEDGE	Software, Patents on Innovations	INTELLIGENCE
GROWING ON LAND	Agriculture, Horticulture, Medicinal Plants	DILIGENCE
MANUFACTURING	Industrial Production at Different Scales	PHYSICAL EFFORT
MINING	Minerals, Oil	EXPLOITATION

Some specific areas for focus

The significant initiatives that reflect the resource potential of the state and the current global economic scenario include the thrust in organic agriculture, medicinal plants, bamboo and fibre development, creating infrastructure for software industries and eco-tourism. Besides these, several other measures are needed. However as the government is realizing quickly, these efforts need not just the technology but also financial and institutional mechanisms for handholding to achieve significant results for which the Government must function as a true facilitator. In order to ensure that the wealth created while safeguarding the environment is retained locally, the government must ensure that the new initiatives are truly people oriented, rather than centralized initiatives. These require a major attitudinal change amongst policy makers.

organic agriculture

the promotion of organic agriculture has to be a state priority. It is also an imperative to maintain the ecology of the soil as well as promote moisture

prudence in agriculture. This then must be central to the state agricultural policy, which must necessarily make available resources and technology to those aspects of agriculture that ensure organic agriculture while meeting the state's food security needs – banning the use of chemicals and HYVs, promotion of indigenous seed saving, mixed cropping, decreasing the emphasis on just two crops – rice and wheat, enlarging the PDS basket to include millets, local sourcing of PDS stocks to ensure that farmers are given a good price for their products. All this will require attitudinal changes not just on the part of the bureaucracy, but of the farmers, the truckers, the market, and middlemen as well as consumers, making the task even more challenging.

medicinal plants

the promotion of medicinal plants would require that the forest department should have enabling laws so that people can use their common lands for more explicit livelihood uses. Concurrently, it would need the banks and rural development departments to increase the resource availability to the people, and scientific and technical departments to provide the requisite inputs for generating high quality products. The industrial and resource policies should also reflect this by recognizing the overarching intellectual rights of communities to the resources and knowledge so that the fruits of the effort put in by communities and public sector institutions are not captured by corporations.

tourism

in the tourism sector, the plans of various sectors such as urban development, transport need to converge when developing destinations, so that the local communities have a say in the planning process, and benefit economically from such development. Instead of having large external investment oriented tourism development, widespread development of destinations all across the state will benefit local communities and reduce the need for importing goods and services. Conscious reorientation of tourism to reflect local culture and values has to be undertaken as against infrastructure development merely to cater to demands of so-called tourists. This will enable sourcing of local materials and skills and change the complexion of nature of tourists where tourism is no more a bane to the local community but a benefit.

Redefine PPP (Public Private Partnerships) to include People

In the short run, one of the important shifts occurring in the economic reform process is the idea of Public-Private partnerships and a number of initiatives have been taking place with State and other promotional institutions. The word "Public" is almost always interpreted as the state, and not the people. Thus such partnerships become a mechanism for transferring people's wealth to the private industry, with the state acting as the conduit.

There are various mechanisms to explicitly involve people who are directly within the area of an industry or enterprise, even in projects that have already been operational. These include mechanisms such as issuing preferential shares based on well evolved criteria on a case to case basis before finalizing such Public - Private – People Partnerships. This would go a long way in evolving socially responsible enterprises and for the people to provide all the local support needed for the enterprise to flourish. Such processes will better address concerns of occupation rather than purely benefiting existing corporates who would be willing to raid the State or nominally institute activities to benefit from a favourable tax regime.

Donor programs are based on capacity building and financing of pilots with the accountability being based on the reputation risk for the implementing agencies and monitoring agencies. There is normally no commercial stake for the players and the project risk of failure increases after the donor involvement comes to an end. It is predicated on that if pilot developmental projects are successful then they can be easily replicated with the subsidy coming from the state. In a sense for the pilots, the donor is a proxy for the state role for enabling development and poverty alleviation.

A truly public private partnership would be a partnership between the people as a community and the private sector, with the state acting to ensure that the rights of the people are not ignored or trampled upon. Such partnerships will be built only where the people identify the need for inputs from the private sector to meet their social and economic needs, unlike the current process where the Private sector pursues its goals of profit making without any regard to the needs of the community, and state only legitimises the process.

Continued peace and harmony without the build up of vested interests.

The greatest environmental asset of the region perhaps is where discontent is democratically expressed and the huge social, environmental and financial burden of conflicts over natural resources and livelihoods are obliterated. People have recognized the role of community as a whole in effective management of its resources, and have always established practices, which did not create a conflict between individual and the community. As a consequence of this there are hardly any dramatic economic and other differences within and between communities. This calls for very careful planning so that vested interests do not grab benefits and inequities are not raised. An equitable community provides the very basis for future and needs to be fostered as central to all societal efforts.

Address Situation Specific Environmental Concerns

While sectoral changes and integration will take time it is important to address situation specific concerns expressed by people in different ecosystems. The redressal of these issues will enable incorporating lessons learnt from specific regions and evolve a diverse range of options.

Consistently Address Systemic Changes

Sustainable Development at the functional level could be conceived as a process of using resources that do not deplete the options for the future generation – more cryptically – it means generating more alternatives while conserving existing options. Communities will be sustainable only when they are in harmony with the ecosystems.

If the processes for Sustainable Development of a community have to lead to its being in harmony with its ecology, then it should reflect upon the following aspects which identify and characterise sustainable development:

- It has to be environmentally sound and demonstrate the potential to renew;
- It has to be enabling the evolution of a more equitable community;
- It has to be creating a community which is self-reliant or endogenous in accessing its needs and investing into its future and
- It has to be economically-efficient.

It is also widely recognised that all these principles have to be concurrently adhered to and addressed at various scales (individual through community to the global scales) and different levels of human intervention (policy, programme and practices).

The current impasse we are really faced with arises out of the precarious situation where developmental activities of the past have had a massive impact on deepening widespread poverty, squalor and environmental degradation, but a feeble impact on sustainable development of local communities and their capacities to maintain/improve their environment and well being.

The real challenge that stare us in the face, is the challenge to hone our skills, choose our technologies and build our resources in such a manner that it provides for the human needs of Food, Clothing and Shelter and enhances the quality of Water, Energy and Biomass systems. The challenge beyond the basic needs is that the Community, Government and the Market should be able to provide the basic inputs - health, education and occupation - for societal development.

This demands that we walk beyond institutions and sectors, even nation-states and regions to seek solutions. And, it is becoming clear that this can only happen as an accretionary process.

2. Decentralised Energy Options: towards a low carbon pathway

Sanjay Khatua

Power generation and climate change: no rain! have coal...

Two seemingly unconnected news items showcase our most urgent contemporary dilemma: our dependence on fossil fuel, climate change, its impacts and the potential solutions.

The first one relates to the power generation and distribution in Orissa. To cope with the shortage of water in the dams due to low rainfall at the upper reaches of the river systems, the Government of Orissa has taken decision to stop hydro power generation with immediate effect (The New Indian Express 15th October, 09 Bubaneswar edition). In the event of shutting down of the hydro power generation, the self proclaimed 'energy surplus state' will have a net shortfall of about 1300 mega watt as against its requirement of 2400 MW during daytime and 2900 MW during the evening peak.

Orissa was the first state in the country towards introduction of sweeping reforms in the power sector (1996-99), unbundling generation, distribution and transmission along with assured supply of power. The estimated demand of power in the state was 1334 MW in 2001-02, which rose to 1760 MW during 2006-07. During this period, the state's share in the total installed capacity of the state sector power projects was 2814.86 MW and that of generated power was 1542.67MW – 840.34 MW from Hydro power projects and the balance 702.33 MW from thermal power projects. During 2006-07, 207 MW of surplus power was sold to other states. (Economic Survey, Government of Orissa, 2007-08).

Sanjay Khatua, Freelancer, socio-developmental research and communication. Director of DHARA

The Hydro reservoirs of the state are in a depleted condition, hence the decision to shut down the hydro power stations till January 15. The extraordinary decision was taken keeping in view the water requirement for rabi crops and the increasing power demand during the summer months. The Chief Minister who reviewed the situation observed that the situation is not only due to hydro failure, but the government has not been able to further capacity during the last ten years. The consumption base for electricity has increased from 16lakh to 26 lakh in the last 5 years. The state government pins its hope on the expansion of capacity of the existing thermal power stations and the corporate power plants (Sterlite, Bhusan), which are scheduled to start their thermal based production soon.

Officially, out of the total inhabited villages of 46,989 (1991 Census) 19% villages were not electrified as on 31.03.06. The Government of Orissa is committed to electrify all the villages in the state by 2009 and each household by 2012 as per an MoU signed with the Government. of India (under Rajiv Gandhi Grameen Vidyutkaran Yojana and other schemes). In general, the demand for power is increasing (32% during 2001-02 to 2006-07) and the state is moving towards high industrialisation. Also, the demand in several crucial sectors like agriculture are yet to open up, which at present accounts for a meagre 1.68% of the total power consumption.

'The problem areas in the power sector are its over dependency on hydropower projects, which is prone to climatic uncertainties, transmission loss and resource crunch. The dependency on hydropower is however reducing gradually with the generation of more and more thermal power. The state is promoting power generation by encouraging private investment in the sector envisaged under the Orissa electricity reformation act 1995'-observes the Economic Survey , 2007-08, Government of Orissa. More as a post script, the same document observes, 'the state government is also keen to promote renewable and eco-friendly non-conventional sources of energy'.

The other news item concerns an email of a friend, who works in the alternative energy sector and shares his excitement and frustration. The excitement is about the commissioning of yet another community managed micro hydro plant where he was involved as technical facilitator. The micro hydro established on the hill steam of an Adivasi village will provide light as well as power for milling of food grains, pulses etc. in a remote Adivasi region in Andhra Pradesh. His frustration is also rooted in his excitement – in

different parts of the eastern India as well as other parts of the country communities have been managing micro hydro and solar power generation plants over the last decade. These plants have worked as catalysts to bring about a number of changes and convergences, especially the utilization and management of the natural resources contributing to the overall socio economic improvement; and other qualitative convergence in health hygiene, women's empowerment, education, community initiatives and so on. But there has not been any initiative on the government side to take notice of it, forget wider replication. Considering the over-enthusiasm of 'taking electricity to all the habitations' under Rajeev Gandhi Rural Electrification or similar schemes, it would not be surprising to see some of these villages connected with the grid, he adds.

In context of the climate change and energy debate, these 'unconnected news' bring to the fore a number of dimensions:

- the climate change induced rainfall pattern renders the hydro based power generation vulnerable
- increased dependence on thermal generation,which contributes to GHG emission, and adversely impacts the micro-climate and the livelihoods of the million as well
- energy generation and utilisation, especially at the community level, is not seen in integrity with inclusive and sustainable development
- the successful and diverse community based models of using community managed energy projects as converging platforms of sustainable development are nowhere reflected in the road map to face the challenges of the climate change in a country with amazing diversity of natural resources and indigenous wisdom.

Energy scenario in India: Majority have no access to the conventional energy

According to Central Electricity authority of India, there are around 83 major coal fired thermal power plants and 305 hydro plants existing in India. As per the ministry of power statistics, the total installed generating capacity (thermal + wind) during 2003 -2004 was about 79838 MW and hydropower generation was 29500 MW. In addition to this, there are more than 1800 selected industrial

Sl. No.	Particulars	All India status
1	Inhabited villages	5,87,556
2	Villagers electrified	4, 74,982 (81%)
3	Rural households	1,38,271,559
4	Electrified households	60,180,685 (44%)
5	Un-electrified households	78,090,874 (56%)

units which had captive thermal power plants of >1MW. According to National Thermal Power Corporation (NTPC), coal is used for approximately 62.3% of electric power generation in India, oil and gas accounts for 10.2%, hydro's share is 24.1%, nuclear, wind, and other contribute the remaining 3.4%.

The energy policy of the government (GOI) states that "a village is deemed electrified when 10% of the total number of households in the village is electrified". Large percentage of villages and household are not electrified yet - at national level only 81% villages and 44% houses have been covered. The service is inadequate, unreliable and of poor quality. In general, the conventional energy has not reached majority of the marginalised communities and it has yet to play any significant role in improving their livelihood (even where it has reached). Usually Government considers extension of the conventional grid to distant villages uneconomical, with tremendous losses in transmission of power; it ends up 'covering' distant Adivasi/Dalit habitations only symbolically.

Renewable energy constitutes only about 8.2% of total energy consumption - most of which consisits of the conventional renewable. Hydro power, which involves large scale hydro projects and even larger displacement of the indigenous communities and forests, accounts for 6.3%. India's approach to renewable technology dissemination and popularisation has had limited success due to various barriers in planning, implementation, capacity building, social engineering, publicity, allocation of and access to financial resources and technology adaptation to local needs. The policy of the government is to increase the share of renewables through large-scale projects to meet future energy needs. The share of decentralised energy (energy which is locally managed and controlled) - small scale projects serving the need of small remote habitations, especially Adivasi communities, is hardly visible. Indian

renewable energy programmes need more thrust at this stage at the Central and State governments. Renewable energy needs to be categorized and declared as a priority sector. The country needs a Green Power Policy.

Energy, Climate Change and the Marginalised Communities

The marginalised majority of the world continues to depend on local environments and resources, are the smallest contributors to the causes of climate change, but are the most vulnerable to the impacts of the climate change. The implications for India are enormous as about 60% of the population can be said to be marginalised. Adivasis, Dalits , fisher-folks, small-scale farm families, livestock herders and wide range of occupational groups living in rural areas, including forest and hilly terrains, flood plains, drought prone plateau lands and cyclone prone coastal tracts, largely depend upon local natural resources and eco system services.

Large proportions of these populations still depend on biomass, kerosene and diesel for their energy needs. In many pockets they have lost their forest, land and water for generation of electricity (hydro, thermal and nuclear). But neither have they benefited from the electricity generated, nor have the projects contributed to the quality of their livelihood. For example, compare the development indicators in undivided Koraput district of Orissa, where 4 mega hydro projects are located: 62% villages officially electrified against state average of 81%, irrigation is only for about 20 percent of the land, literacy rate 24 percent and more than 70 percent families live below poverty line.

In India, about 70 percent of the electricity comes from coal, mostly mined in rural forested areas of Orissa, Jharkhand and Bihar, with complete disregard for the human rights of the local communities and for ecology. Most of the coal based energy goes to feed the export oriented, energy intensive industry and the carbon dioxide released in the process contribute to the climate change. When the climate changes the socio-economically marginalised, who get little benefit from the mining industrialisation process are the hardest hit. The regions, which were part of vibrant forest eco-systems till the recent past, at present experience temperature soaring around 50 degree Celsius -for example, Angul-Talcher-Bramhani belt in Orissa and the fishing communities along the river Bramhani have lost their livelihoods, thanks to the waste water from the coal mines and the thermal power plants released to the Bramhani river systems.

Coal, is the important fossil fuel, is the mainstay of India's energy generation. India now ranks 3rd among the coal producing countries. Most of the coal production in India comes from open pit mines: these contribute over 80% of the total production. Opencast mining is considered 'cheaper' but leaves the environment in a shambles, especially as there is no effort to reclaim land. The landscape in opencast coal mines are dotted with artificial hills - the soil removed during mining is dumped nearby in form of huge mounds, threatening the existence of hundreds of villages - the useless soil on the upper part of these mounds runs off with rainwater to nearby farms, further reducing the already depleted soil fertility. The problem of large-scale displacement of poor people is the inevitable corollary of the changeover to opencast mining. Thousands more will be uprooted in the days to come in view of the massive expansion of coal mining. Those who remain get the worst of the deal. Coal dust and high levels of air pollution from thermal power plants and the associated industries make the air a strange mix of the carcinogenic and the unbreathable. For instance, the Talcher-Angul coal mining-thermal power and industrial belt is one of the 14 most polluted places in India.

India at present produces around 120 million tonnes of ash per annum. The power requirements of the country are rapidly increasing with increase in growth of the industrial sectors which would depend on Thermal power as main source. As a result the quantity of ash produced shall also increase. The carbon footprint of the National Thermal Power Corporation – India's largest power company for 2006-07 is 168.7 million metric tonnes (calculation recently publicized through reports in the Carbon Monitoring for Action (CARMA) database on the global power industry). The company has a total power-generation capacity of around 29,000 MW, of which 86% is coal-based –NTPC is the largest consumer of coal in India, needing 125 million tones to run its power plants. The company plans to add 21,941 MW of new generating capacity between now and 2012; of that, 15,180 MW will be through coal-fired plants and the rest from gas and water-based projects. In the report, 'Integrated Energy Policy', the Indian Planning Commission projects that electricity-generation in India in the next 25 years will increase up to eight times; that this will require an enormous rise in our use of coal (up to four times as much). Researchers say such energy direction will propel India's per capita emissions up to 3.6 - 5.5 tonnes of CO_2 by 2030.

Energy development and Climate Change cannot be viewed in isolation. Fortunately, Climate Change is increasingly being recognized as a development

issue for many reasons - from a macro perspective it questions the fossil fuel based development model that the world has been pursuing since the industrial revolution. This current development model is threatening the earth's sustainability and could have irreparable consequences. From a micro perspective the impacts of climate change affects those that are most vulnerable: the marginalized majority of the world.

While the impacts of climate change are predicted to affect India adversely in the next century, there is worldwide concern about the rising emissions of India – it has twin pressures – pressure to develop and pressure to mitigate emissions. The current contribution of India to the GHGs is well below countries like USA and China, and its per capita consumption is one of the lowest mostly because 70% of India's population still lives in rural areas at the sustenance level. India needs energy to develop and the current trend reveals increasing energy consumption in the industrial, transportation and domestic sectors at a rate even faster than China. During the period 1980 -2001, India's energy consumption increased by 208% from 4.16 quadrillion Btu (quads) to 12.8 Btu (quads).

The growth and the development of the population that still lives in rural areas will mean an exponential growth in demand for energy, even at basic sustenance levels. The issue then is how to integrate the development needs of the poor with a reduction of levels of emissions in the atmosphere? This implies that unless we adopt a model of development that takes into consideration the carrying capacity of the Earth we will not be able to address the climate issue.

Shift in the development pathway and the energy link

The low energy and consequent low carbon emissions of the various local communities, - coastal, mountainous, forest, arid and semi-arid, and urban communities – may at one level seem to be by default, and less a choice; and not seen as a really desirable lifestyle. However, the practices in production and local consumption of food, clothing, shelter and energy gain greater relevance in the context of GHG emissions. It is these communities in fact which have been conservers of the environment - by choice or default!

It is the voices of these communities which are missing in national and international policy. At the national level for example, the NAPCC mentions

biodiversity as a national priority but the government is planning to build at least 168 major dams in Northeast India, for example, which is one of the 25 mega biodiversity zones of the world. More than 80 major thermal power plants are being planned in the coastal areas which too are rich in biodiversity. These projects will cause massive destruction of bio-diversity: forests, rivers, ecosystems of tribal and other societies. The concept of economic growth, development and prosperity needs to be reviewed with a rational long-term perspective. Climate Change is not yet one of the components of the environmental impact assessment (EIA). 687 mining projects and 316 Special Economic Zones (SEZs) and other projects like Coastal Corridors have been sanctioned without taking the impacts of Climate Change into account.

According to the Planning Commission, Report of the Expert Committee: Integrated Energy Policy, August 2006, 'India needs to sustain an 8% to 10% economic growth rate, over the next 25 years, if it is to eradicate poverty and meet its human development goals...Coal shall remain India's most important energy source till 2031-32 and possibly beyond... Coal accounts for over 50% of India's commercial energy consumption and about 78% of domestic coal production is dedicated to power generation. This dominance of coal in India's energy mix is not likely to change till 2031-32...With a concerted push and a 40-fold increase in their contribution to primary energy, renewables may account for only 5 to 6% of India's energy mix by 2031-32'.

A shift in developmental pathway is not possible without linking the development direction and our commitment to financing clean energy technology. But the integrated energy policy of the Government of India based largely on current sources of energy, coal and petroleum, is inconsistent with the policy of reducing GHG emissions. Commitment over the next few decades must be linked with today's truth that, conventional sources of energy productions piles up disastrous emission, destroys wide range of natural resources and livelihoods.

In view of the huge potential available in our country the energy security on a sustainable basis is feasible only if we base our energy policy largely on renewable and decentralised energy sources. As long as our energy policy emulates the energy profligacy of the developed countries, which is based on consumerism, we cannot hope to meet the unabated energy needs of our burgeoning population.

Decentralised Energy Options: towards a low carbon pathway

Neither uncontrolled growth nor the government-promoted intensive technologies hold solutions to long-term sustainability. The search for a solution has to be in the direction of environmentally and socially conducive technologies and lifestyles.

Decentralised energy options (DEOs) have the key dimension of local management of the energy systems and the livelihood convergences for the people in various geographical niches - including the Adivasi population of India, 573 communities that constitute about 8 percent of the more than 1 billion population of the country - addressing livelihood concerns and reducing environmental stress; converting their disadvantage as advantage. The experiences with DEOs have successfully demonstrated the potential of the community managed DEO in converging all the ingredients of the sustainable development – economic, social and environmental.

In the context of climate change the challenge is to ensure energy supply which is accessible and affordable in way that does not lead to proliferation of GHG emissions in the atmosphere, and at the same time ensures sustainable development. DEO has great untapped potential to meet this challenge.

The provision of energy is critical to help people escape poverty. Renewable energy technologies offer clean and sustainable options for generating energy. When owned and managed in the right way they can make a dramatic contribution to poverty reduction.

The linkages between rural energy and poverty alleviation, and the potential contribution of renewable energies for rural electrification, have both been well documented over the past two decades. Renewable energy sources such as solar, wind, micro hydro and biomass are indigenous, non-depleting and environment friendly and can play an important role in securing future energy requirements. It holds relevance to the energy deprived areas that are distantly located and have little or irregular access to supply line.

Grid interactive renewable power

Sl. No.	Source/ systems	Estimated potential (MW)	Cumulative estimated capacity (as on 31.03.05) MW	Potential utilised (%)
1	Wind power	45000	3595	7.98
2	Biomass power	16000	302.53	1.89
3	Bagasse Co-generation	3500	447	12.8
4	Small hydro (up to 25 Mw)	15000	1705.63	11.37
5	Municipal solid waste	1700	17	1
6	Industrial waste	1000	29.5	2.95
7	Solar photo voltaic	20MW/ sq. km	2.8	Negligible
	Total	**6099.46**		

Wind Power

Of the gross wind energy potential estimated at 45,000 MW India has an installed capacity of 2,483 MW as of March 31, 2004 (India is now the fifth largest wind power producing nation in the world after Germany, USA, Spain and Denmark). The cost of power generation is estimated to be Rs. 2 to Rs. 2.50 per KWh, depending on the site. The cost per unit of power comes down drastically, five years after the project commissioning due to the cost of fuel being nil. The wind harvested power is both cheaper and reliable than other conventional sources of power. States with high wind power potential are Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Kerala, Rajasthan and Madhya Pradesh.

Biogas

Biogas which contains about 55 per cent to 70 per cent inflammable methane gas is a clean and efficient fuel for rural areas. It is produced when organic materials, such as, cattle dung and leafy biomass are decomposed in the absence of oxygen. It is used as cooking and lighting fuel in specially designed stoves and lamps respectively. It can also be used for replacing diesel oil in duel-fuel engines for generation of motive power and electricity.

Improved Chulhas

Energy-efficient wood-burning cook-stoves, popularly called improved Chulhas are scientifically designed for optimal regulation of heat and better fuel utilization. The National Programme on Improved Chulhas (NPIC) was initiated in 1986-87 for fuel wood conservation and elimination/reduction of smoke in the kitchen. Some 350 lakh improved Chulhas have been promoted till March 31, 2004. The actual users are far less. More than 30 models of fixed and portable improved Chulhas are now available for family, community and commercial applications.

Small Hydro

There are about 4000 potential sites with a total capacity of 10,071 MW for projects up to 25 MW. Micro-Hydro technology is now a mature technology that has benefited from substantial improvements and has gone through different phases of improvements :

- a technological phase to improve and demonstrate the viability of the technology;
- a social phase where the objectives are largely to meet the needs of rural people in just the same way that investments have been made in other community project / infrastructure; and,
- a financial phase, in which the emphasis is on financially sustainable Micro-Hydro schemes.

Micro-Hydro offers good potential to be financially sustainable, for example

- a high load factor – can provide for productive end-use applications such as 7.5 HP/5.5 KW processing mills, 2 KW leaf pressing units, and other such processing units;
- there is scope to contain costs through good design and management; and,
- maintainable by the village community with short duration training and orientation, and generation of corpus fund for maintenance thorough bearable regular collection of fees and generation of resources through strategic utilization of the local resources. Micro-Hydro compares well with the alternative energy supply options and has an important niche in the range of decentralized energy supply options.

Biomass Power

Currently, biomass contributes 15 per cent of the total energy supply worldwide and 40 per cent of this energy is consumed in developing countries, mostly in the rural and traditional sectors of the economy. The various applications of biomass energy include thermal or heat, mechanical water pumping for irrigation and power generation including village electrification. Official estimates reveal that with an investment of Rs. 20 lakh, the energy needs of 100 households of a village can be fully met.

Solar Energy

Solar energy utilization through thermal and photovoltaics routes has been growing over the last two decades. Today India has the largest decentralized solar energy programme in the world. Solar photovoltaic systems (SPV) have found applications in house holds, agriculture, telecommunications, defence and railways. The country has a strong manufacturing base for solar cells modules and systems. It can provide consultancy services in the setting up of manufacturing units and projects in rural electrification, water pumping, and SPV power plants.

Local communities in different eco-systems have been facing crises of unimaginable magnitude; and they have shown resilience in the face of such adversity, as well as have developed innovative capabilities, building on their local traditional knowledge, in tandem with the large numbers of people from the mainstream, who have chosen to explore with these communities on what is possible for sustainable living in the modern world.

Civil Society groups have played a pro-active role in demonstrating the potential and in influencing polices based on grassroots realities - working on a wide range of DEOs: solar, micro hydro, smokeless 'chulha', bio fuels, etc. The results of such experiments and innovation are lessons in sustainable living; and need to be included in any 'planning' for a low carbon alternative. The real challenge is to influence decision making in favour of the marginalised in a way that the objectives of people centred development and a low carbon pathway are achieved simultaneously. The experience from different DEO interventions linking to the sustainable development should help the decision makers at all the levels to ensure improved livelihood and living conditions through improved energy access.

Local Solutions to Global Problems: an example of the potential of DEO

The Power of Change: the Putsil way

Putsil, a village inhabited by about 96 families, mostly Kondhs, one of the indigenous communities of the region is located in the scenic Deo Mali hill range of Orissa, India at an altitude of 1150 metres. Proximity to the district headquarters and four mega hydro-electricity cum irrigation projects had little benefit for Putsil. Like many of the villages in the region, Putsil too did not have electricity.

In respect of the resource base and the traditional livelihood, Putsil was like other villages in the region. Ninety-one per cent families were either landless or marginal farm families. Shifting cultivation, terrace cultivation, collection and processing of forest produces, and wage labour were the major sources of livelihood. Nevertheless, it was different in respect of collective initiatives.

Villagers of Putsil now enjoy the benefits of electricity - 'Power', which they Generate, Use, Manage and Own. The Putsil Micro Hydro Plant (PMHP) based on water flow from four small perennial streams has been generating 10 KW of electricity since August 1999. It has potential to be up scaled to 25 Kilo Watts. The power generated at present is sufficient to have lighting, run TV/radio for all the families during night, and run a rice-huller and machines for grinding and oil extraction during daytime.

Establishment of the plant was preceded by series of intensive interactions with the community for about two years. The objective was to build capacity of the community in management of the Micro Hydro Project, and in the effective use of power and other end use applications; build future vision for sustainable control and management of other resources, and create space for technologists, scientists, NGOs to interface with the communities on decentralized energy options. The Putsil Micro Hydro Committee comprising of 7 members (includes 3 women) manages the power generation and distribution. The Putsil Village Committee comprising of 21 members (includes six women). There are six groups under the committee and each group is assigned with specific tasks such as repair, maintenance of the check dam, canals, desilting fore-bay tanks, penstock line, catchments area management, etc. Apart from these committees, Putsil also formed a Forest

Committee comprising of 7 members (2 women) to protect the forests and manage the forest resources of Putsil for sustainable use.

The Community contributed about 2,13,000 INR in form of labour towards the establishment of the plant (total investment about 17,00,000 INR). The approach employed by the community to manage the plant has effective combination of traditional and practical needs which is reflected in timing of power supply, collection of fees, compensation for services to operate the plant and other end use machineries.

Since 1998, each family has been paying an average of Rs.10/- towards electricity fund. Eelectricity is supplied for family use from 6 pm to 10 pm, and again from 3 am to 6 am; and then from 6 am to 8 am to run the Mill. The early morning power supply was initiated as per the demand of women to complete household chores before leaving for the field. During marriage, childbirth, serious illness, festivities and other such occasions power is supplied as per need.

Initially, two youth from Putsil were trained to run the plant - they in turn trained others. Against their services, the three 'barefoot engineers' get free labour of 25 person days every month from the community for land development and agricultural activities. Every night, one or two persons from the village carry food for the operators and stay with them at the plant located about 1.5 kilometre away from the habitation. Selection of persons from landless families to manage the Mill and other responsibilities shows the community's concern for justice and sharing.

The process of community mobilization for establishing and managing the plant has triggered convergence of allied aspects – better management of other community resources; regeneration of catchments through multipurpose plantation; forest protection and management; sustainable utilization of land, distribution of water for irrigation, change of wastelands to cultivable lands, creation of new lands, terracing and bunding of the degraded hills, and other collective initiatives of development. Putsil is sustainably using its land resources and about 473 acres of land have been developed and irrigated with water from the streams apart from power generation over the past 20 years. Access to 'Power' has brought substantial changes in sanitation and hygiene, increase in food and income, reduction in drudgery of women; and access to information through electronic media. The overall impact is the

improvement in the quality of life with dignity, and sustaining bio-diversity and the local ecology.

Since the inception of the project, Putsil has been receiving hundreds of visitors including people from neighbouring villages, members of the community organizations, civil society institutions, government officials from the State and outside, even from abroad. While Putsil received loads of appreciation for the sustained effort and endeavour to include different

The potential convergence of DEOs: zero displacement, no submergence of land and forest; community development, integrated development linkage. 1 KW of Micro-Hydro power produced can save 1.35 tons of carbon dioxide emisisons.

Courtesy: The future NRMs, IRDWSI, 2008

resources of the village under the community management, the visitors, quite few of them got the inspiration and the confidence -'if Putsil could do it, communities at other places can do so'. Over the years, slowly but steadily the Putsil initiative has spread its wings - a number of community managed micro-hydro plants have come up; and a few are in the pipeline in the region and in the neighbouring States. Putsil indeed has provided the trigger in grounding 'local solutions to global problems', especially in the context of accelerated climate change due to luxury and industrial emissions.

Energy and sustainable development

The energy scenario in India today looks quite challenging. With an installed generating capacity of less than 150,000 MW and a per capita consumption of a mere 650 units of electricity, India is suffering from huge shortages—nearly 10% in energy terms and almost 17% in peak energy (2007/08). Energy shortages and peak shortages in 2003/04 were 7.1% and 11.2%, respectively. These shortages in the system are increasing rapidly because of our inability to meet more than 40%–50% of the targeted capacity addition requirements in the last three Five-year Plan periods. And, this is the situation when over 50% of India's rural population does not even have access to electricity!

The Integrated Energy Policy (2006) observes: We are energy secure when we can supply lifeline energy to all our citizens, irrespective of their ability to pay for it, as well as meet their effective demand for safe and convenient energy to satisfy their various needs at competitive prices, at all times and with a prescribed confidence level considering shocks and disruptions that can be reasonably expected.

In the context that energy can play a major role in enhancing the quality of livelihood, the fact that needs to be considered is that in our country about 27.5% of the population lies below the poverty line (there are states – Bihar, Chattisgarh, Jharkhanda, Madhya Pradesh, Orissa, Uttaranchal, Uttar Pradesh, where it ranges from more than 30% to more than 46% of the state's population (2004-05). Percentage of net-sown area irrigated in the country is 40% (2002-03, C.M.I.E, Agriculture, March 2006). Nearly two-thirds of India's total cultivated area is drought-prone, and nearly 40 million hectares of land area are flood-prone. The impact of Climate Change on agriculture is well imaginable. Similarly, a mean sea level rise of 46-59 cm has been projected along India's coast by the end of the century, with a 15% increase in the

intensity of tropical cyclones. This means 250 million people who live within 50 km of India's 7,500 kilometers of coastline will be vulnerable.

The rural population in India still depends largely on biomass in general, and fuel wood in particular, for meeting domestic energy needs through mainly non-commercial energy sources such as firewood, biomass and cow dung in inefficient devices to meet their daily energy demands for cooking and water heating. This is one of the major contributing factors for Indoor Air Pollution (IAP) - nearly 28% of the world IAP accounting for 2.5% of the global ill health - the inefficient chullahs emit a lot of smoke causing immense damage to the health of the women and children.

While we talk of a shift in development path and clean energy, in place of equitable distribution of energy linked to development, an insidious elitism is growing in the consumption of the electricity - consumption that is based on luxury than on sustenance. Consumption fed by mega power plants at the cost of the basic living and misery of millions in name of 'inclusive growth' with little consideration for those who bear the brunt of the policies, or for whether energy production could be a platform for better livelihoods and inclusive growth.

While our government apparently takes a stand that because of the need of the development and growth of its population it can not agree for voluntary emission, can it ignore these ground realities? Can it think of growth of development without linking it with the intensive carbon emissions, based on an equitable energy path?

The traditionally-rooted communities have preserved the environment for centuries and they continue to do so. Many countries in the North are now recognising and imbibing the traditional South-eastern wisdom in pursuit of sustainability, while we still seem to be treading the conventional path of destruction-based development.

The energy pathway to be followed for sustainable development entails extreme innovation – both in technology use and in policies, and in international partnerships at unprecedented scales. India hopes to achieve a fairly high rate of growth over the next several decades – notwithstanding the current global financial crisis. Energy availability – in adequate quantities and good quality – would be a prerequisite to sustain these levels of economic growth and the desired social development. However, the quantum of energy

demand would obviously be a function of the energy pathways that India can choose to adopt or design to follow. The energy policies are controlled by the state and the local communities have hardly any role in decision making relating to energy access. There is lack of basic information relating to the potential and access of renewable energy in the remote areas.

Policy making relating to energy should be done through the public consultation at the grassroots taking into account the learning from the community managed alternative solutions. Energy use should be part of the development process creating a sense of individual empowerment down the line. Inclusive growth and equity in energy sharing is great idea, but still too much of an administrative formula. The government has not been able to push it forward in innovative ways.

So far as energy and the climate change are concerned we are left with polarised debate. The case of Orissa, the 'self proclaimed energy surplus state' showcases the fragility and the hypocrisy relating to energy policing in context of the climate change. Failure of rain in one year sets off an energy surplus state into energy deficit, and the 'realisation' that it needs to promote thermal based power, which plays havoc with the macro and micro climate and the livelihood of the millions. And the alternatives sit nicely in some remote corners. The present debate and the desperation on climate change, the urge to play correctly, and the commitment to inclusive growth should become a spur to making our system more open and transparent, and start massive initiatives of social, cultural and economic outreach.

Modern India has little time for abstractions that do not deal with the ground realities. A shift in the developmental pathway is not possible without linking the development direction and our commitment to finance clean technology and combat climate change. The commitment over the next few decades must be linked with today's truth, that conventional sources of energy production pile up disastrous emissions, and destroy a wide range of natural resources and livelihoods.

While it is true that it is the developed countries that are the cause of the climate change problem because of historical emissions, it is also true that the developing nations are going to be the future large emitters because they need to respond to the development needs of their populations. This calls upon us as a large developing nation to play a leadership role in advocating the

development of a fair climate agenda in the global context that recognizes the issues of equity at the international and national levels.

"A technological society has two choices: It can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions, or, a culture can provide social checks and balances to correct systemic distortions prior to catastrophic failures" -Mahatma Gandhi.

We have to act now - because 'many drops make a flood'.

3. Sustainable Agriculture: Issues and Action Points

Aditi Kapoor

Introduction

Agriculture is one of the key areas under threat from climate change. India, still an agricultural society with three out of five people dependent on agriculture and related activities, is particularly vulnerable to climate change. Agriculture, though lacking investment and showing stagnant growth, contributes 21% to the GDP and constitutes 11% of India's exports. Agriculture and allied activities support some of India's sunrise industries such as food processing, medicinal herbs, dairy farming and fish production. People dependent on agriculture form the proverbial 'bottom of the pyramid' and whose rising incomes alone can take India on to the path of growth and development.

Small and marginal women and men farmers, who form over 80%, or the bulk of India's farming population, are already finding it harder to cope with higher, variable temperatures and erratic rainfall patterns. In Gorakhpur district, Eastern Uttar Pradesh, for instance, shorter winters and sudden hot winds in the winter months have lowered wheat production, because wheat needs consistent low temperatures to mature properly. Farmers are giving up growing *arhar dal* (a common pulse) for the same reason and this has sent *arhar* prices soaring in the whole of India. The growing season for the popular pulse is now far warmer and the flowers cannot fruit. In Himachal Pradesh, the apple belt has moved upwards to cooler climes, leaving apple growers and the related packaging and transport industry to look for alternatives. In Anantapur district, Andhra Pradesh, sudden, untimely downpours have damaged mature groundnut crop just when the farmers were looking forward to harvesting a good yield to ensure food in their homes for the next 12 months.

Aditi Kapoor, Lead Specialist (Economic Justice), Oxfam India

Climate scientists predict a gloomy future for agriculture

World scientists predict a gloomy future for climatic changes and their impact on agriculture in the Indian sub-continent. The Nations' Inter-governmental Panel on Climate Change (IPCC) fourth assessment report (2007) already records declining rice and wheat yields in north-western India as a result of increased water stress, caused by increased temperature, reduction in the number of rainy days and increased frequency of El Niño events.[1] The scientists also note degradation of crop land by saltwater penetration up to 100m inland in the Bay of Bengal during the dry season, caused by sea level rise, storm surges, erosion, and excessive ground water withdrawal. There has also been significant loss of coral reefs, with likely impacts on fisheries, and destruction of mangroves in the Indus delta (including in Bangladesh) due to reduced freshwater flows and salt water intrusion.

Scientists predict that disasters in the sub-continent will become more unpredictable, frequent and intense. Poor people, whose livelihoods are primarily dependent on land, water and forests, will be the worst affected by these disasters. Their models show that temperatures will increase by around 0.5-1.2°C, sea level will rise by 1-3 mm per year. Worse, the sea level will continue to rise for centuries even if greenhouse gas emissions are cut, largely because sea water expands as it gets warmer but this expansion is slow and so will continue for a longer time. Further, annual precipitation is likely to increase by less than 10% but there will be more variation in the monsoon from year to year. Also, tropical cyclone intensity will continue to increase, with an increase in storm surge heights on coasts. Heat waves and very heavy rainfall events are also expected to become more common.

The global scientific report predicts that climate change will decrease agricultural production and farm revenues. The causes of this are complex: although increased atmospheric CO_2 would on its own increase grain yield, increased temperatures decrease grain yield directly and also indirectly by increasing water demand, and more frequent droughts and floods also reduce yield. Even by the most conservative estimates, a net decline in grain production of 4-10% in South Asia is predicted by the end of this century. Rice production could decline by 3.8% during the current century while in India,

[1]El Niño-Southern Oscillation (ENSO) events are temperature fluctuations in surface waters of the tropical Eastern Pacific Ocean that are the main sources of between-year climate variability in countries around the Pacific, Atlantic and Indian Oceans.

rain-fed wheat and maize yield is likely to decline by 2-5% over the next few decades.

Livestock productivity is also expected to decline due to reduced productivity of pasture, heat and water stress as well as increase in some diseases. Declines in marine capture fishery production are likely due to increased frequency of El Niño events, reduction in ocean productivity due to changed circulation, etc. Changes to freshwater fisheries and aquaculture are inevitable but poorly understood yet.

Summary of vulnerability of key sectors to climate change in South Asia:

Sector	Vulnerability	Confidence of IPCC prediction
Food and fibre	Highly vulnerable	High
Biodiversity	Highly vulnerable	High
Water resource	Highly vulnerable	High
Coastal ecosystem	Highly vulnerable	High
Human health	Highly vulnerable	High
Settlements	Moderately vulnerable	Medium
Land degradation	Highly vulnerable	High

India's National Action Plan on Climate Change recognizes the changes in climate predicted for India and what this would mean for agriculture. Quoting studies by the Indian Agricultural Research Institute (IARI), the NAPCC says: 'Every 1 deg centigrade rise in temperature reduces wheat production by 4-5 million tons. Small changes in temperature and rainfall have significant effects on the quality of fruits, vegetables, tea, coffee, aromatic and medicinal plants, and basmati rice. Pathogens and insect populations are strongly dependent upon temperature and humidity, and changes in these parameters may change their population dynamics. Other impacts on agricultural and related sectors include lower yields from dairy cattle and decline in fish breeding, migration and harvests.'

Considering that two-thirds of India's sown area is drought-prone and about 40 million ha is flood-prone, climate change will have a devastating impact on agricultural production in India. About 30 million people are affected each year in north and north-eastern flood plains.

It is, therefore, not surprising that one of its eight missions is dedicated to sustainable agriculture. The mandate of the National Mission on Sustainable Agriculture is to 'develop strategies to make India's agriculture more resilient to climate change'. The Mission notes that there is a need to 'identify and develop new varieties of crops, especially thermal-resistant varieties and alternative cropping patterns capable of withstanding extremes of weather, long dry spells, flooding and variable moisture availability.' The fourfold focus areas are dryland agriculture, risk management, access to information and use of biotechnology. The approach of the Mission, however, is not pro-small farmer and continues to be technology and market driven, ignoring several studies and field experiences that have proved that small and marginal farmers, who produce most of the food in developing countries cannot afford purchased inputs and large machines but need vitality of local natural resources to ensure sustainability of agriculture.

The Mission also ignores a serious scaling up of local and nature-friendly traditional solutions available for drought-proofing, taking advantage of elevated CO_2 concentrations, better yields and increased resistance to disease and pests. Genetic engineering, as proposed in NAPCC to deal with the above problems, may not be sole answer for the majority of our farmers who are small, often work on fragile soils with hardly any government support and minimum infrastructure. Science needs to be married in a pragmatic fashion with local knowledge, expertise and acceptance, needing wider consultations, a bottom-up approach and encouraging activities like farmer-to-farmer learnings, especially with women farmers who shoulder the bulk of the farming work, and a land-to-lab learning process.

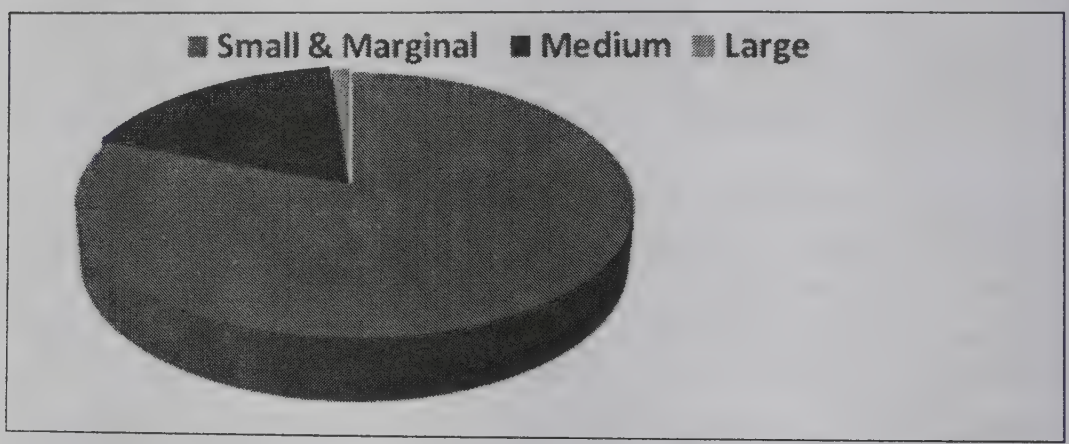
Food insecurity to hit small farmers, especially women, first

In the IPCC report, world scientists agree that it will be more difficult for South Asian countries to meet their growing demands for food. Increased urbanisation and decreased production (yield declines, limited availability of cropland) make increased demand and reduced supply all-but inevitable. This is very likely to result in increased cereal prices, with subsistence farmers worst hit. The report says that the risk of hunger[2] is already high and could increase by approximately 7-14% within the region.

[2]Food security is hard to predict as it also depends on the production and demand from other countries.

The Indian government is also worried that changing climatic conditions are going to hit the country's food security. Those to be affected first and worst will be the 71.2 million marginal farmers and 21.6 million small farmers with less than 2 ha of land. Together, they form 81% of the 115.50 million landholders in the country. Add to this the landless rural population which is already finding less work on the land as production is decreasing due to climatic variability. A little less than half of India's rural population, or 43%, is landless. Considering more than 80% of the smallholders have no irrigation facilities but depend on rain for growing crops, the situation becomes very bleak indeed.

Break-up of size of farm lands



Among small and marginal farmers, the plight of women farmers is worse. Though being in majority, the small and marginal farmers hold only a third (36%) of the total land resources. Women shoulder 60-80% of the farm work but own only about 10% of farm land. According to the report, in most regions women perform all operations pertaining to livestock management, crop production such as sowing, transplanting, weeding, harvesting as well as post-harvest activities such as threshing, winnowing, drying, grinding, husking and storage. Men often do only ploughing and help with sowing and threshing, usually doing tasks requiring lesser labour than women.

Yet, the government does not recognize them as farmers in their own right. So the research and development, the extension services, the credit policies and marketing systems do not address women farmers' needs and concerns at all. In the wake of climatic variability, women farmers face the threat of being completely asset-less, with no support from the government or the market. When their families migrate in distress, they even lose their social protection which comes from their support systems within the extended families and

larger community. Even the seminal 1954 Land Reform Act, which seeks to benefit the dalits and other socially marginalized groups does not focus on women. In some places like Andhra Pradesh and Maharashtra, there are a few examples of civil society organizations effectively using the law to issue land titles at least jointly in the names of wives. Though being worth emulating, this is not enough to ensure ownership of land among women farmers.

Interestingly, the IPCC does repeatedly emphasise the importance of access to basic social services for poor producers, good governance and their participation in decision-making in responding to climate change. The IPCC, however, does not take into consideration the gender aspects and the need to focus on women farmers as change agents through inclusive interventions and inclusive governance.

Unsustainability of conventional agriculture

Poor men and women farmers are both currently affected by the predominant agriculture systems that depend more on chemicals and large irrigation projects for boosting crop yields than on better soil nutrition and conservation of local water resources. They do not have the wherewithal to be dependent on markets for inputs such as seeds, fertilizers, water and pesticides. Ironically, this form of agriculture accelerates food insecurity in the long run as these farming practices degrade land and contaminate waterways with pesticides and herbicides (United Nations Information Centre (UNIC), May 2009 newsletter). Many of the crops grown with these chemical inputs are often water guzzlers and overuse groundwater without insuring against future water deficit through rainwater harvesting. These agriculture systems also encourage monoculture for optimum use of chemical sprays and thereby strip the soil of its nutrients without replenishing them through traditional practices such as crop-rotation and inter-cropping, which also ensure crop diversity. The residues from these crops cannot be used for fodder because they are full of unwanted chemicals. Instead, the crop residues are burnt, as in Punjab, the home of chemicals-driven agriculture. The excessive heat from the burning kills soil bacteria and fungus in the top soil, depriving the next crop of these natural soil nutrients. Instead, it means pumping in more chemicals. Even Norman Barlough, the father of the green revolution and much criticized now for promoting chemical-rich agriculture, has been quoted somewhere as having advised caution in optimizing the use of chemicals. That, however, is history.

India's agriculture policy, in focusing only on conventional agriculture to the exclusion of traditional agriculture still practiced by lakhs of small farmers, has remained myopic and witnessed stunted growth. The emphasis on wheat and rice through the National Public Distribution System (PDS) has, for instance, forced people to grow water-guzzling paddy in rain-fed arid zones by marginalizing coarse cereals that had the double advantage of being suited to the agro-ecological zones and being more nutritious than wheat or rice for poor farmers who cannot afford to buy food from the market to keep malnutrition at bay. If India is home today to the world's most malnourished people, this dimension of PDS has a definite role to play in it. With climatic changes, it is indeed imperative that coarse cereals become part of the 'adaptive crops' and are promoted by the government.

Several farmers practicing sustainable agriculture have also found that traditional crop varieties, and even local animal breeds, are more resilient to the changing climatic impacts than 'imported' crop varieties and animal breeds or cash crops grown as a single, stand alone crop. In the current conventional model of agriculture, the government however offers no incentive to farmers to cultivate flood resistant or drought resistant seed varieties. In flood affected Jogia block of district Sidharthnagar, where small farmers were forced to take only one crop, the rabi (winter) crop because of climate change, the use of a traditional early maturing paddy variety, Narendra-97, has given them the security of now taking three crops. The farmers found that their kharif (summer) crop, which took 135-150 days to mature, was often destroyed by the early floods and the intense rains which caused water-logging. Narendra-97 ripens in 90-100 days, can withstand the intense heat during May-June and provides good fodder. It makes good chivra (snack made of beaten rice) and sells well in the market. The variety was revived with help from the government agriculture university in Faizabad, Uttar Pradesh.

In the flood-prone Madhubani district of Bihar, for instance, Jaleshwar Yadav of village Gamhariya (block Satdhara) has been growing the fast disappearing barnyard millet that is an early maturing traditional coarse warm climate crop and can be harvested before the advent of floods. In flood prone eastern Uttar Pradesh, small farmers have benefited from switching from sugar cane, which can withstand floods but is water intensive but cannot withstand heat stress under changing climatic conditions, to the traditional and less water-intensive, more hardy maize crop which they can harvest before the arrival of floods and also get good fodder from the rest of the plant. The plant fills the gap between

the rabi and kharif crop so that land does not have to be left fallow. In this flood-prone region, the last two years have interestingly seen 'drought,' a condition thus termed when farmers do not get rains for up to two weeks in the monsoon season. Their crops cannot cope with the dry season.

The conventional chemical-and-irrigation-dependent agriculture systems have affected poor women farmers more. Men farmers now have more knowledge, and control over the increasing market inputs (seeds, fertilizers, pesticides, credit, even technology) needed to grow wheat, rice and most of the other food and cash crops – and have more access to markets. The vanishing of climate-resistant coarse cereals, for instance, has eroded the power women had over their farming systems. Women no longer go to the haats (local markets) to sell the extra ragi, bajra, jowar and other millets so have no cash incomes to give them a bit of economic freedom within their homes. They also now have little control over production and find it more difficult to ensure food security within their households. The adoption of these 'adaptive millets' will specifically help poor and small women farmers by reviving women's traditional knowledge of seed varieties, cropping patterns and harvesting cycles, giving them more production and better incomes. If the PDS is re-aligned to include regional marketing networks for local 'adaptive' millets, women can then access a wider market.

Women also face decreased milk production from their small animals and where help from visionary civil society organizations is available, increasingly prefer native species as they are more resistant to the local climatic changes.

Differences in conventional and traditional agriculture

Conventional agriculture *Less adaptive; Less resilient*	**Traditional/sustainable agriculture** *More adaptive; More resilient*
Linear relationship between each component of agriculture – cropping, animal rearing, agro-forestry	Cyclic relationship with mutual dependency
Driven by a single target of *maximising output*	Driven by multiple targets like *yield, fodder, replenished soil nutrients, water conservation, less energy intensive*
Usually suited to mono-cropping	Suited to multiple crops, also food crops
High dependence on market for inputs	Less dependence on market for inputs

Sustainable agriculture is adaptive

An Oxfam India-initiated civil society research paper authored by Dr G.V. Ramanjaneyulu and Dr Kavitha Kuruganti, both scientists and organic farming activists, shows how the better drainage and water holding capacity of organic soils reduces the risk of drought and soil erosion. The paper quotes a recent technical paper from International Trade Centre (WTO) and FiBL to say that organic (or sustainable) farming practices are in a good position to maintain productivity in the event of drought, irregular rainfall events and rising temperatures. The technical paper notes that soils under organic management retain significantly more rainwater thanks to the "sponge properties" of organic matter. Water percolation is 15-20% more in organic systems. Water capture in organic plots is twice as high as conventional plots during torrential rains, which in turn reduces the risk of floods.

The paper continues to say that the most important component of organic systems - diversity - contributes a lot to the resilience of organic farms. Enhanced biodiversity of organic farms have several positive ecological implications – pest prevention, and similar effects on diseases, better utilization of soil nutrients and water etc. Organic farming is also associated with decreased irrigation needs by about 30-50%. This becomes an important part of adaptation in drought conditions.

Given that the more ecological farming models are sustainable and have a strong adaptation potential, India's agriculture policy must re-oreint itself towards this.

Small farmers need sustainable agriculture

Having said that small farmers are at maximum risk from the impacts of climate change, climate-resilient sustainable agriculture offers best hope for them. They do not have savings or alternative livelihoods that will see them through if their crops fail or their livestock dies. Sustainable agriculture is particularly beneficial for women many of whom still retain the traditional knowledge of bio-fertilisers and bio-pesticides. Several on-the-ground experiments across India have shown how this knowledge, coupled with some modern scientific innovations, has helped poor farming families tide over the hunger crisis. For instance in village Janakpur (block Compeeganj), district Gorakhpur, Uttar Pradesh, women use pest repellent compost made at home

and NADEP that protects their crop even when it fails to rain for many days. The crop remains green and fresh. This also protects the 'friendly' insects while killing the 'hostile' insects; chemical pesticides indiscriminately killed all insects.

The name NADEP is derived from the name of the originator of this method of composting called, N.A.D Panduri Pandey.

A number of agricultural wastes are available in farmland. But farmers in many areas still use conventional ways of pit composting, which takes almost a year for decomposing agro-wastes. At the same time there is plea from organic farmers that sufficient quantities of organic manures are not available locally. NADEP composting is an easy way to recycle agricultural wastes rapidly to produce good quality manure. The agricultural wastes and other organic wastes available on-farm can easily be converted into compost quickly using NADEP method.

The use of unscientific agricultural practices for years has increased the incidence of many crop diseases and resulted in loss of soil fertility. Moreover the abundance of micro flora and fauna has been drastically reduced from the agricultural lands. Reviving soil fertility is of utmost concern for agricultural sustainability. Farmers like to apply organic inputs but lack of proper composting methods prevents them from doing so.

The other advantage is the ability of small farmers to take up mixed cropping, crop-rotation and even agro-forestry when practicing sustainable agriculture. In Dudhai village (Sardarnagar block), district Gorakhpur, Uttar Pradesh, for instance, Prabhavati and her husband, Suryabhan, own just 1.5 acres of land, but use their piece very intensively growing a wide range of as many as 52 cash and food crops through the year using organic farming practices. These include paddy, bajra (coarse cereal), *maruwa* (traditional millet), groundnut and *til* (oilseed); vegetables like *lobhiya, tori or nenuwa,* lemon, bottle-gourd or *lauki and kathal;* fruits like guava, papaya, mango, *chakotra,* blackberries, mulberry and the *mahua* tree. They also grow shrubs with pest repellent properties like *neem, madaar, kaner,* trees of timber value, particularly *saagwaan,* several medicinal plants, spices like ginger, *haldi* or turmeric, *laung* and even bamboo.

The couple has married their traditional knowledge with scientific know-how to improve their traditional practices. For example, earlier Prabhavati used dung as manure but she did this arbitrarily so that a lot of its nutritive value for the farmland was lost. Then she learnt how to dig trenches and do composting

in them and how to use green manuring in a better way. She also learnt how to use cow urine, do vermi-composting and prepare NADEP. Though NADEP is to be made in a wood and cement enclosure, Prabhavati uses her home-grown bamboo and tree branches to make the enclosure. She has also learnt how to use produce from local trees and shrubs to prepare pest repellents. In many places, for instance, villages plant saunf or fennel on the borders of their small farms because the strong, sweet smell repels 'hostile' insects and also keeps wild animals like the *neelgai* at bay. Simplicity can indeed work wonders.

Sustainable agriculture can be food secure

The Ramanjaneyulu/Kuruganti paper deals with the critical question of whether sustainable agriculture or organic farming will be able to feed the growing population. On-the-ground sustainable agriculture experiments over large field areas have shown that this does not imply lowered yields. The authors quote an FAO report (2007) which says that "conversion of global agriculture to organic management, without converting wild lands to agriculture and without using N-fertilisers would result in a global agricultural supply of 2640 to 4380 Kcal/person/day". It is believed that sustainable intensification in developing countries through organic practices would increase production by 56 per cent. A meta-analysis of 133 scientific papers concluded that organic agriculture was particularly competitive under lower yield environments, a feature that is common in developing countries. Organic yields on average are comparable to conventional yields although yields do decline initially when converting from high-input systems and almost double when converting from low-input systems. In India, it should be remembered that a majority of land is rain fed and continues to be low-input by default.

The table here will give an indication of how crop yield, and cost-benefit ratio is exceedingly favourable, capable of preventing farmer suicides, under sustainable farming rather than under conventional farming:

On 6.4 ha, with 8 farmers in Punukula village, Andhra Pradesh (Kharif, 2001-02)

Particulars	Sustainable Agriculture	Conventional Agriculture
Average yield of cotton (Kg/ha)	1575	1450
Cost of plant protection ($/ha)	4300	8595.2
Net income ($/ha)	3420	-5200

Source: CSA, Hyderabad

To take the example of Subash Sharma, practicing sustainable agriculture for 14 years on 12 ha in Dorli, Maharashtra, the following positive fallouts of doing sustainable farming speak for themselves.

- For every 2½ acres of land, pits were dug for rain water harvesting resulting in augmentation of water supplies.
- Water holding capacity of soil is enhanced. Now 1cm rainfall in a ha of land results in 50000 lit of water absorption.
- About 3000 trees with 2000 of teak and others like mango, *sapota,* neem, tamarind, *jamun,* papaya &, *sithaphal* yield good incomes
- Trees have reduced the temperature by 3-4 deg centigrade, attracting birds to kill pests and adding bio mass.
- Every year, 10 tonnes of biomass per acre of land is incorporated in the soil.
- During 2007-08, there was very little rainfall (600mm) but the crops survived
- In 2006-07, the crops survived heavy rains
- Groundwater level has increased and Sharmaji now gets three crops a year

Conventional agriculture deepens the climatic crisis:

Mitigation potential of sustainable agriculture

After showing what needs to be done, it maybe worthwhile to list the ills of the conventional model of agriculture being promoted by India, and indeed the rest of the world. What are some of the fallouts of this agriculture?

For one, the subsidies given towards fertilizers and pesticides are growing at a phenomenal rate. It had crossed India's defense budget of Rs 1,05,600 crores in 2008-09 but following the 26/11 terror strike in Mumbai, the defence budget was hiked by 35% in 2009-10 and stands now at Rs 141700 crore. While agriculture funding needs to go towards adaptation to help poor, small farmers grow enough food themselves and for the world, the fertilizer subsidy simply swells the coffers of fertilizer and pesticide companies, encouraging them to spew more greenhouse gasses in the process of manufacturing and transporting. At the farmer level, the subsidies help the bigger farmers who have the wherewithal to buy them off the shelf, rather than small farmers who

end up living beyond their means if they buy these inputs. With climatic changes leading to reduced production and crop failure, the fear is that the number of suicides by small farmers may simply go up.

The growing subsidy for fertilizers in India

Years	2005-06	2006-07	2007-08	2008-09
Fertiliser Subsidy (INR/crores)	18299	25952	40338	119772* (estimated)

Source : Department of Fertilisers, Min of Chemicals and Fertilizers, Govt of India
The New Indian Express, July 8, 2008

The other major problem with conventional agriculture is its huge dependency on energy. The Ramanjaneyulu/Kuruganti paper deals with the mitigating potential sustainable agriculture:

> **Reduction in GHG emissions:** *Changes in farming models and practices towards sustainable agriculture offer a significant opportunity at reducing GHG emissions. Organic farms use on an average 33 to 56 per cent less energy per hectare, as per FAO (2007).*
>
> *Organic farming reduces its fossil fuel dependence in many ways. For instance, for soil productivity management, internal inputs and practices are used rather than chemical fertilizers – example, creating the micro-climate required for increased soil (beneficial) microbial activity. This is done by returning bio-mass to the soil. Legume production, crop rotation, mixed cropping etc., are other ways of achieving this. Pest management also does not depend on chemical pesticides but a variety of local resources and practices.*
>
> *IFOAM - International Federation of Organic Agriculture Movements - notes that avoidance of methane emission is also possible through organic agriculture – through the promotion of aerobic micro-organisms and high biological activity in soils, oxidation of methane can be increased. Through practices like System of Rice Intensification, which is mostly based on principles of ecological farming, flooding in rice paddies can be reduced and thereby, methane emissions.*
>
> *Nitrous oxide, result of overdoses and losses on nitrogen, can be effectively minimized through sustainable agriculture practices. While production of chemical fertilizers is an energy-intensive process that emits carbondioxide and nitrous oxide, application of nitrogen fertilizers makes the soil emit nitrous oxide. These can be avoided through organic farming.*

Sustainable agriculture also increases the Soil Organic Carbon (SOC) by incorporating organic materials into the soil. Soil can be a major source of storage of carbon, about twice as much carbon as in the atmosphere. Fertiliser use replaces soil organic matter in intensive systems, which reduces potential sequestration. Crop, tree and livestock integration with a systematic recycling of organic wastes is an integral part of sustainable agriculture. Long term studies have shown that compost application and cover crops in rotation were particularly adept at increasing soil organic matter even in comparison to no-tillage techniques. While conservation tillage is promoted elsewhere as a way of sequestration of carbon dioxide, this is often done by the use of chemical herbicides and GMOs which have their own ecological implications. In sustainable agriculture however, mitigation of climate change can be addressed both by carbon sequestration in the soils and minimized emissions of GHGs. Agro-forestry is also a desired principle of organic farming which further adds to the potential of Sustainable Agriculture in carbon sequestration.

Action points

A civil society workshop organised in December 2008 brought together practitioners, government scientists, agriculture university professors, policy advocates and activists to sit with India's key climate negotiator and convince him of the need to change India's approach to agriculture. Since then, the negotiator has started talking about 'low external input agriculture,' even at industry meetings which is indeed welcome. More recently, organic agriculture has featured as one of the key components in the proposed national mitigation body. The announcement was made by India's Prime Minister so the hope is that merits of sustainable agriculture have reached the top echelons of decision-making. At the state level too, there have been some welcome steps in the near past. Himachal Pradesh has officially adopted organic agriculture, following Andhra Pradesh which came up with an organic agriculture policy about three years ago and has been rolling it out through its structures.

The National Mission on Sustainable Agriculture incorporates some of the recommendations made at the December workshop but the approach has still to change. One of the major challenges is the belief that bio-genetics can tackle climate impacts in agriculture. The jury is still out there on this and the Mission should first consult widely and learn from field experiments before taking decisions that may be impossible to roll back at a later date. Farmers, especially small farmers, have been withstanding climatic changes since they started ploughing the land. Now they need to be supported through the climatic

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shocks that they are witnessing in a way that builds on their knowledge and expertise as far as possible. These farmers have many of the answers and the government needs to hear them.

Below are the recommendations, or action points, that summarise what the government should do to help small farmers adapt to climate change and to help mitigate climate change caused by conventional agriculture. These recommendations have been presented to the Indian government and are part of the paper authored by Ramanjaneyulu/Kuruganti. These action points still need to be reiterated, more loudly, at every forum for them to be really heard and incorporated into the government's new interventions.

- ***Definition of sustainable agriculture required:*** *Sustainable Agriculture is a misnomer for what has been proposed under the name of Sustainable Agriculture and therefore, a correct, common understanding of the term is required. The current set of proposals would not lead to improving the soil health, central to sustainable agriculture, nor to cyclical models of farming, internalizing farm inputs (including crop waste) into farming systems, which define sustainable agriculture*[3]*. On the contrary, the existing suggestions would continue the conventional linear, intensive models that further the existing dependency of farmers on external agencies for everything, including for knowledge. That is one of the reasons for the current day crisis in agriculture.*

- ***Creating the imperative for the paradigm shift:*** *The NAPCC makes no mention and assessment of Green Revolution-induced climate change in India. Shying away from stating the issues with the current model of agriculture will not create the imperative for a shift to sustainable agriculture, which is a requirement both for mitigation as well as adaptation. The NAPCC should clearly specify incentives to farmers for shifting to organic farming and sustainable agriculture practices. The government should realize that the imperative to shift to sustainable agriculture is larger than climate change.*

  The NAPCC, especially in the sections related to agriculture, does not bring up mitigation possibilities at all – while that could be a posture adopted at the international level, for common but differentiated responses, it is interesting to note that the only place where mitigation is mentioned is to make the entry of Genetically Engineered crops a possibility. Further, the NAPCC should expressly acknowledge

[3]Sustainable agriculture includes organic agriculture and is variously referred to as ecological agriculture or natural agriculture. It is characterized by agro-forestry, mixed cropping and crop rotation.

the potential that exists of mitigating GHG emissions from farming through a shift to organic farming.

- ***Policy approach:*** *Strategies should be evolved for a time-bound phasing out of climate change-inducing practices towards sustainable agriculture with clear targets and financial outlays. This includes a focus on the role of pasture lands, fisheries, animal husbandry (rather than the bias on crop husbandry that is present in the NAPCC) and seed banks governed by farmers' bodies as major thrust areas for adaptation. Or, when plans are made about access to information, the emphasis should not be just on information packages to farmers in a top-down manner about geo-spatial impacts of climate change, but also data on conventional vs. organic practices so that informed choices can be made by farmers.*

- ***Biotechnology:*** *On the use of biotechnology, especially genetic engineering, as part of the NAPCC (National Mission on Sustainable Agriculture), it is felt strongly that the government should focus on reducing the present subsidies to GHG-emitting practices like fertilizers rather than come up with GE seed varieties which are supposed to reduce GHGs. The proposed research like conversion of existing C3 plants to C4 plants for better adaptation using GE tools may not yield any results. Instead the focus should be on promoting crops like Millets which have C4 pathway and are more efficient in adapting to the climate vagaries. In fact, an assessment of the stress (in) tolerance of GE crops, high resource consumption and biosafety questions should be an important part of understanding the implications of Genetic Engineering as an agricultural technology in the era of climate change.*

- ***'Land to lab' programmatic interventions:*** *The NAPCC focuses too much on setting a research agenda for the NARS (National Agricultural Research System), following the old model of 'lab to land' research and not so much about programmes to be implemented immediately at the farmers' level. In the context of climate change and adaptation, there is hardly any time to be lost and farmers' need for resilient systems cannot wait for more research in the old paradigm to be taken up. The need is for solutions discovered from the farms, assessed and validated and spread to others, especially in terms of adaptation. There is a strong opinion that there is enough evidence of time-tested practices and experiences from the ground of certain sustainable agriculture principles and practices creating resilient farming systems. Further, civil society organizations also have enormous experience with creating effective people's institutions at the ground level which will allow for the delivery of programmes in an effective fashion. Therefore, the overwhelming need is for immediate programmatic interventions drawing on the strength of traditional knowledge and resources, farmers' innovations and experiences with the civil society.*

Alternative, horizontal extension systems with farmers' organizations at the centre are an important part of information-centred addressal of climate change.

As part of the NAPCC, capacity building of agriculture scientists and extension workers on organic farming should be taken up so that they are equipped to take the message to farmers.

- ***Traditional knowledge & resources:*** *The National Action Plan does not give adequate prominence to traditional resources and knowledge, which need to be made a cornerstone for interventions on sustainable agriculture. It was felt that popularization of traditional knowledge in addition to ever-evolving innovations in the fields of practicing organic farmers should be considered to be an important component of adaptation to climate change in agriculture. Such farmers, especially women farmers who are the traditional custodians of such knowledge, should be identified and lessons learnt and disseminated through the extension system.*

  There should be an emphasis on falling back on indigenous resources (seeds, animal breeds etc.), which have proven track record of adaptation to stress conditions. The Plan should also make Seeds, as replicable resources in the hands of farmers, especially women farmers who have been the traditional custodians of these seeds, institutionalise the form of seed banks, as a major thrust and strategy for adaptation. As part of the NAPCC, there should be a mechanism evolved to track and monitor genetic erosion for all of the country due to climate change. Women's knowledge on this aspect needs to especially harnessed and built upon.

- ***Centre-State relations:*** *State governments should be involved in consultations and planning right from the beginning – it is not enough that centrally-evolved plans are imposed upon them. In fact, it is ultimately the departments of agriculture and the extension and delivery mechanisms at the state level which will directly take everything to farmers and support them to bear the consequences of climate change. For instance, seed rolling plans need to be evolved by each state, with an emphasis on revival and restoration of open-pollinated, traditional and locally-adapted varieties and extension services need to be revamped and re-oriented, including a gender perspective and gender-responsiveness, at the state level.*

- ***'Public-People' Partnership:*** *Similarly, it was felt that civil society and its institutions should also be involved in planning and implementation related to the NAPCC. For instance, alternative, horizontal extension systems with farmers' organizations at the centre are an important part of information dissemination and learning for adaptation to climate change. The stress should be on public-people partnership in the Plan. There should be recognition that only market-driven*

technologies are not the answer in the era of climate change. There is a need for renewed thrust on public research in partnership with farming communities, especially women farmers.

- ***Risk management:*** *When it comes to Risk Management, it should be acknowledged first that the existing risk management strategies and mechanisms have failed farmers badly. There is a need for complete recasting of the existing models and mechanisms with special focus on risk insurance for women. We need new mechanisms to assess damage and loss and better ways to deliver support - including weather insurance, livestock insurance and effective crop insurance.*

- ***Clear convergence:*** *The Plan should clearly spell out how it converges with other plans and missions both within the NAPCC as well as in other agencies like the Planning Commission.*

- ***Social safety nets:*** *As part of adaptation strategies, strong social security nets should be put in place for the rural households, including a provision of minimal incomes, pension, insurance etc., with special emphasis on the agriculture workers, especially women who continue to outnumber men wage labour on farms.*

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4. Climate change and water
Dehydration in the time of warming

Dr. Indira Khurana, Richard Mahapatra,
Ranjankishore Panda

Introduction

Climate is changing for sure. For India, where nearly 65 percent of population depends on natural resources, this change is equivalent to a life sentence. Climate change will impact the poor the most as their dependence on natural resources is higher than others. Surviving on less than Rs. 15 a day, this is a change that the country's 300 million poor can hardly afford.

The impacts are showing up frequently with increasing severity. India is witnessing contrasting weather conditions. 2009 is an example of things to come: amidst its worst drought in last nine decades, Andhra Pradesh and Karnataka witnessed the severest flood of last one century. In 2004 large tracts of the country faced floods while another large tract prayed for rain. In 2005, India's financial capital Mumbai witnessed unprecedented rainfall: it received 944 mm of downpour in just 24 hours. That was the highest single day rainfall ever recorded in any city of the country. Next year India's desert district Barmer in Rajasthan received 577 mm of rainfall in just three days. That was more than twice what the district normally receives in a year. "In my 72 years of life, I had not seen a flood like this. My father never talked about anything like this also," says Teja Ram from Kawas village of flood ravaged Barmer. Climate change is already having a heavy toll in India. An estimate reveals that

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related extreme events have killed nearly 4.5 million people in India since 1900, inflicting over US$36 billion of damage (OFDA/CRED, 2007).

Climate change will impact the water resource of the country greatly as the natural hydrological cycle becomes distorted. It will not only affect water availability but also its distribution. Though there are not substantial scientific studies on specific impact on water sector, it is clear that the scientifically validated impacts like drought and extreme weather condition would have impact on water resources.

At the global level water sector is increasingly getting focus under various global negotiations on climate change. This is the first sector which was given an exclusive treatment under the IPCC which has produced a technical paper on the impacts of climate change on water *(See box: "Water in the negotiation process", pp 88,89).* In India's National Action Plan on Climate Change also the water sector has been marked as one of the eight core subjects to be addressed with specific plans to mitigate climate change impacts.

A Favourable Climate

India is a union of very diverse and sensitive eco-systems. It has all: high mountains, wetlands, fertile plains, arid lands, vast coastal areas with many islands and deserts. Many of these regions are quite fragile or sensitive to climatic changes and face tremendous anthropogenic pressures. Indian land mass constitutes only 2.4 percent of the world's land area but supports about 16.2 per cent of the world's human population. Naturally, anthropogenic pressures on harsh regions like Himalayas and the Thar deserts are also highest in the world for such conditions. The coastal areas, which are quite vulnerable to climate changes, boast of a density that is nearly 1.5 times more than the national average of 324 persons per km^2. Such high anthropogenic pressures become even more pronounced as about 60 percent of total population of India is directly dependent on agriculture and another 17 percent depend on fishery or natural resources for their livelihood. This makes India the country with highest poor population in the world. India ranks a lowly 134th[i] position in the Human Development Index.

Worrying Trends

The Scientific Assessment Reports of the Inter-governmental Panel of Climate Change (IPCC) find that increasing greenhouse gases emission would

accelerate in the future as a consequence of which the average global surface temperature is projected to increase by between 1.4° and 6°C above the 1990 levels by 2100. The temperature will increase at global level, though at regional levels both increases and decreases are likely. Several recent studies have confirmed an increase in the inter-annual variability of daily precipitation in the Indian summer monsoon with increased greenhouse gases. An intensification of the Indian summer monsoon and an enhancement of summer monsoon precipitation variability with increased greenhouse gases has also been re-confirmed in recent studies.

Scientists warn that the country will experience a decline in summer rainfall by the 2050s, which account for 70 per cent of the total annual rainfall over India. India's perennial rivers, which originate and depend on glaciers melt in the Hindukush and Himalayan ranges, will also be affected badly due to climate change. Rising temperatures will also contribute to the raising of snowline, reducing the capacity of the glaciers which serve as natural reservoirs, and increasing the risk of flash floods during the wet season. As because the melting season coincides with the summer monsoon season, any intensification of the monsoon is likely to contribute to flood disasters in the Himalayan catchment.

Sea level rise is another major concern for India as its 7,500 km long coastline is densely populated and supports at least 2.7 million families. Studies have confirmed a trend of sea level rise in excess of 3 mm. every year in parts of Indian coastal areas. Thermal expansion alone is projected to raise the sea level by about 25-40 cm by 2050. This could inundate low lying areas, down coastal marshes and wetlands, erode beaches, exacerbate flooding and increase the salinity of rivers, bays and aquifers.

Threat to Water

As pointed out earlier, climate change impacts the key sources of water like the monsoon and the glaciers. These are the prime sources for groundwater as well. One of the most significant fallouts of the warming has been noticed in marked changes in rainfall pattern. India's initial communication to the UNFCC (popularly known as the NATCOM report) has mentioned that rainfall had increased by 10 to 12 percent than normal rainfall in the west coast, north Andhra Pradesh and north-west India. Similarly, decreasing trends in rainfall of 6 to 8 percent than normal have been observed over east Madhya

Pradesh and adjoining areas, north-east India and parts of Gujarat and Kerala. A Study by noted scientists U. Mohanty *(Professor, Centre for Atmospheric Sciences, Indian Institute of Technology, New Delhi)* and M. Mohapatra *(Senior Scientist, India Meteorological Department, New Delhi)*, has found that rainy days are decreasing by one day every five years in western Orissa and Central India.[ii] The Working Group II for the IPCC 4th assessments has also observed lower number of rainy days along the east coast of India. While rainfall increase or decrease has been reported or observed in different parts of the country, intensity of rainfall has certainly been the cause of concern.

The recently declared National Action Plan mentions that analysis of a daily rainfall data set have shown (i) a rising trend in the frequency of heavy rain events, and (ii) a significant decrease in the frequency of moderate events over central India from 1951 to 2000.[iii] This causes imbalance and disasters of the kind that have been witnessed in floods of Mumbai or Rajasthan and droughts of Bundelkhand, Vidarbh, parts of Orissa, parts of South India. Years with simultaneous flood and drought are growing.

Glacier melting has reached to alarming level. A report[iv] has stated that glaciers in Spiti/Lahaul of Himachal Pradesh have thinned by an annual average of 0.85 m between 1999 and 2004. Other glaciers too are melting at a rapid rate. This will have serious impacts on the mountain ecology and the rivers that get their feed from the glaciers. The IPCC 4th assessment has projected that glacier melt in the Himalayas is projected to increase flooding, and rock avalanches from destabilized slopes, and to affect water resources within the next two to three decades. This will be followed by decreased river flows as the glaciers recede. A report[v] says that in less than 30 years from now, the melting of glaciers in the Hindukush and Himalayan regions, which supply up to 85 per cent of dry season water to the rivers in the North Indian Plain, may turn the Ganges, Indus, and Brahmaputra into seasonal rivers - and affect 750 million people.

Melting snow are creating new lakes or causing other lakes to grow. Many such lakes have been identified as too dangerous as their bursting will cause enormous flood damage in the downstream. Studies have found out that the frequency of glacial lake outburst floods (GLOF) events in the Himalayas has risen[vi] during the second half of the 20th century. Retreating glaciers will further impact a more pronounced rise in temperature as there will be lesser

cooling effect. Together, glacier retreat will cause widespread affects from local to far off places and even to sea rise.

Direct Impact

India has only four percent of global freshwater resources but sustains 16 percent of world population. However, the per capita availability of total fresh water is stated to be still safe. But it has been assessed that India will reach a state of water stress before 2025 when the freshwater withdrawal as percentage of total available is projected to exceed 50 percent. By 2025, availability of freshwater is expected to fall below 1,000 m^3 per capita[vii].

These figures project a grim scenario for the future. But still they have not accounted climate change factors while making such assessments. Most projection models point to higher incidences of flooding, glacier melting leading to more flow in some glacier fed rivers for some times and reduced flow thereafter, natural disasters, spread of droughts, less river run-off in the dry seasons and decrease in ground water availability. All these will further reduce per capita freshwater availability. In India climate change would have direct impact on availability and accessibility of water in desirable quantity and quality. This may, on the other hand, demean development initiatives to make irrigation and drinking water and sanitation accessible. Broadly, the climate change is likely to seriously affect the hydrological cycle, which will result in:

- Increased uncertainty in monsoon rains
- More rainfall in lesser time
- Decrease in number of rainy days
- Overall increase in precipitation
- Increased glacial melt run off initially and than afterwards decrease
- Less groundwater recharge due to irregularities in the run off
- Increase in flood and drought situations thus overall problems of quantity and quality
- More water needs for crops thus increase in groundwater uses thus further impacting availability for other uses

The problem is that we have still not properly identified climate change's direct impact on water sector *(See box: "Major Uncertainities", p 87).* The conventional belief is that as the earth warms up, evaporation will increase. Higher levels of

atmospheric moisture are expected to result in an average net increase in global precipitation. But, this simple concept is quickly complicated by the fact that it is still greatly unknown where the precipitation will fall.

For example the conventional thinking has it that India, with global warming, will receive more rainfall. The IPCC 4th assessments have also shown very high confidence in such projections. But a recent study by Indian Institute of Tropical Meteorology (IITM) has found out that 'annual rainfall, especially during the winter and monsoon, has decreased; in over 68 per cent of the country.' The study has observed that it has been raining less in more than two-thirds of the country. However, the rest of the country is having more rainfall. While the IPCC assessments have projected more annual flow in rivers like Mahanadi and Godavari, the study by IITM has observed decreasing rainfall trend in Ganga, Narmada, Godavari and Mahanadi rivers.[viii] So, being still uncertain about the future implications on water and sanitation is the biggest challenge as of now.

However, there is near unanimity that impacts of climate change on water resources will be manifested through increased incidences or intensification of drought, floods, cyclones and heat wave and other like sea level rise and glacier melting. These impacts would have a bearing on drinking water sector.

Drought

The IPCC has projected that rainfall distribution may be more uneven in the South Asia region. There is near certainty that dry areas will increase. Crops are affected in such condition, water availability for drinking purpose and sanitation situation would be worse in such cases.

Traditionally, people of drought prone and dry regions stay prepared to meet water scarcity. But it has been found that their traditional mechanisms are increasingly falling short of meeting water requirements. Water supplies in trains and tankers have become regular events in states like Tamil Nadu and Rajasthan. The Rajasthan government was required to make a plan of Rs. 5.18 billion to provide emergency drinking water supply to drought hit areas of Rajasthan in 2007.

More incidences of drought and spread of dry areas may certainly lead to adverse impact of health, agriculture and socio-economic development.

Drought may turn many of the present sources of drinking water, which are mostly ground water based defunct as ground water level is expected to fall quite rapidly in the face of less water storage and more evaporation. We are already getting several indications of that.

Flood

After Bangladesh, India reports the highest human casualties due to flood in the world. It accounts for one-fifth of global deaths due to flood. 40 million hectares of land in India is prone to flooding. Flooding is regular problem in states like Bihar, Orissa, Assam, West Bengal, Andhra Pradesh and Western coastal areas. Most of the river basins in the north and north-eastern belts of India are prone to flood hazards. Many parts of the country are already witnessing very high intensity rainfall. The Mumbai deluge, Barmer floods, recent floods in Kosi river in Bihar and Orissa's Mahanadi river are indications of impacts of very high intensity rainfall. Floods will cause qualitative degradation of water resources. The IPCC has also projected that incidences of flash floods may increase in dry areas as well. Such incidences may ruin existing water harvesting resources and mechanisms. In such cases distress related to quantitative and qualitative water scarcity magnifies.

Sea rise

It has already been identified that the rate of sea rise in the Sunderbans in the eastern coast as well as Kutch in the western coast is higher than global average. A sea rise of more than 3mm. per year has been observed. The IPCC estimates that the global average sea level will rise between 0.2 to 0.6 meters in the next century. Sea rise will cause coastal inundation; they will also impact both surface and ground water resources in a very big way. Saline ingress is already emerging as a big drinking water problem in most parts of the coastal areas.

Other disasters

Apart from flood and droughts, climate change will cause many other disasters that will have direct impact on water and sanitation. Cyclones and storms directly degrade fresh water. In addition they cause long-term damages to infrastructures that provide drinking water and sanitation access. Super cyclones of Orissa in 1999 and the Tsunami in 2003 caused are examples of that.

Temperature rise & evaporation

Rise in temperature has clearly been observed. The global mean surface temperature warmed between 1.0 and 1.7°F since 1850 (IPCC, 2007). The temperature has been on the rise mostly since the beginning of the 1980s. The decade of 1998-2007 is the warmest on record, says a study by World Meteorological Organisation (WMO). The report also shows that the top 11 warmest years have occurred in the last 13 years.[ix] Climate models project that global warming is likely to reach 2°C above pre-industrial times by the period 2026-2060. The immediate impact of climate change on water will manifest in shortage of water through increased evaporation and higher demand for water. Higher temperature directly causes many health complications which get further aggravated by dehydration or unavailability of water. The warmer temperatures associated with climate change are predicted to decrease dissolved oxygen levels, increase contaminant load to water bodies, reduce stream and river flows, foster algal blooms, and increase the likelihood of saltwater intrusion near coastal regions. All these will have an impact on drinking water.

Glacier melting and glacial river flow

Glaciers are important source of water in the Himalayan region and most of northern parts of India. Water yield per unit area of the Himalayan rivers is almost double that of the south peninsular river systems, which indicates the importance of snow and glacier melt contribution from high mountains. The rate of glacier retreat has been a cause of concern not only from ecological point of view but also from its impact on availability and access of water to a vast section of India's population. A study on the Chinese side of the Himalayas by experts with the Chinese Academy of Sciences indicate that China's highland glaciers are shrinking by an amount equivalent to all the water in the giant Yellow River each year. Larger glaciers like Gangotri are shrinking very rapidly on the Indian side. Should Himalayan glaciers continue to retreat rapidly, water shortages might be widespread within a few decades.[x] While future river flow are a cause of concern in the plains, floods and low snow cover is going to cause water led stress situation. More than 300 million people of India depend on the glaciers and glacier fed rivers whose flows are projected to be uneven. Changes in snow fall and melting glaciers will affect their access.

Impact on Surface and Ground Water Sources

Climate change will have direct bearing on the water and sanitation scenario as both surface and ground water sources will be adversely impacted. Groundwater supplies are considered as less susceptible than surface water to short-term climate variability; they are more affected by long-term trends. "It is obvious that the projected climate change resulting in warming, sea level rise and melting of glaciers will adversely affect the water balance in different parts of India and quality of groundwater along with the coastal plains. Climate change is likely to affect groundwater due to changes in precipitation and evapotranspiration. Rising sea levels may lead to increased saline intrusion into coastal and island aquifers, while increased frequency and severity of floods may affect groundwater quality in alluvial aquifers. Increased rainfall intensity may lead to higher runoff and possibly reduced recharge," says India's national communication to the UNFCCC.

A study[xi] conducted by IITM has projected that hydrological cycle will be more intense, with higher annual average rainfall as well increased drought. That study which included observation and projection of three major river basins of India - Ganga, Godavari and Krishna - has predicted that intensity of rainfall will increase in all three basins and that surface water availability may increase. The general prediction is that total runoff may increase in most rivers but they will cause more flood disasters in the rainy season and runoff will be lesser in the lean season. Further, higher incidences of flooding may damage surface water harvesting sources. Thus there may be less net availability of surface fresh water.

Similarly, climate change will impact ground water too. Ground water is equally important for meeting a variety of requirements. Groundwater has been the mainstay for meeting the domestic needs of more than 80 percent of rural and 50 percent of urban population, besides fulfilling the irrigation needs of around 50 percent of irrigated agriculture. Groundwater serves as the base flow for many streams and rivers. Inland and coastal salinity of ground water is already a big problem. The Central Ground Water Board has identified that about 2 lakh sq.km area of the country has been estimated to be affected by saline water of electrical conductivity in excess of 4000μS/cm. [Water salinity is measured by electrical conductivity, expressed as micro-Siemens per cm (μS/cm). Salinity above 2,500 μS/cm is not recommended for human consumption and above 6,000 μS/cm is not even fit for agriculture purpose.]

Heat wave and evaporation will be another factor that will have an impact on both surface and ground water availability. The study by IITM has projected that even if there will be more rainfall, summer season runoff in Godavari and Krishna Rivers may be less as evaporation loss will be higher. Thus climate change will have definite impacts on both surface and ground water sources.

With this, the sanitation situation will also get aggravated. As such sanitation coverage has not been adequate in India. This is the key reason behind 80 percent of rural morbidity cases. Without access to reliable water sources, people would tend to compromise on sanitation. This may lead to further disease burden in the country.

High Price to Pay

The changes in water sector, especially changes in drinking water and sanitation access, will have severe impact on health and development of people. Water is a major health risk transmitter and at the same time it is the most significant life giver. Various forms of microbial pathogens get transmitted to the human body through water. Though per capita availability of water is presently assessed to be above safe limit, majority of people do not have sufficient access to safe drinking water and sanitation. Thus impact of unsafe water has been quite severe on human health.

Diarrhea causes maximum number of below five-year mortality in the world after malnutrition. Even with 'safe' level of per capita water availability, India accounts for approximately one-fourth of total global under-five deaths caused by diarrhea.[xii] An estimated 1.8 million below five year olds child die due to diarrhea in the world. In India about 600,000 diarrhea deaths are reported every year, out of which about 450,000 are children. Similarly, plays an important role in the seasonal pattern or temporal distribution of malaria, dengue, tick-borne diseases, cholera and some other diarrhoeal diseases. India accounts for a significant portion of world's malaria casualties and infections. Lack of safe sanitation and enabling condition for vectors is a cause of higher malaria incidences in India. About 1.9 million cases of malaria are detected every year in India out of which about 1,000 die.[xiii] In the year 1998, about 20,000 people and an estimated 577,000 DALYs (disability-adjusted life years) were lost due to malaria in India.[xiv] A high humidity, high temperature and higher rainfall combination creates favorable condition for malaria to thrive. It is being projected that climate may become more hot and humid in India and

thus conditions for malaria causing vectors and insects will spread in time and area.

It has been projected that malaria window will increase and malaria will expand to other parts of the country as changes in rainfall, temperature and humidity will create favorable condition for malaria vector to grow. Scientists have warned that climate change will make malaria to persist in Orissa, West Bengal and southern parts of Assam and may shift from the central Indian region to the south western coastal states of Maharashtra, Karnataka and Kerala. Also the northern states including Himachal Pradesh and Arunachal Pradesh, Nagaland, Manipur and Mizoram in northeast may become malaria prone.

Cholera has been identified as a potential threat in India. The IPCC has projected that warmer temperatures in coastal waters would exacerbate the abundance and/or toxicity of cholera in South Asia. Similarly, cholera is still a threat in inland regions. Nearly, five hundred people died of cholera in Orissa in 2007. The reasons were attributed to biological and faecal contamination of the water sources. A decrease in river flow can also cause cholera. A study[xv] has found out that when flow in the Amazon River decreases in the dry season incidences of cholera increases.

So the complexities of climate change and diverse conditions, India is ripe for spread of many infectious diseases primarily arising out of climate change and its impact on water and sanitation. The situation may become more hazardous as our progress and achievement in terms of providing and sustaining safe drinking water and sanitation raises a lot more concern.

India's National Action Plan and the Water Sector

India has finalized its National Action Plan on Climate Change. The plan has been finalized by the high powered Advisory Council on Climate Change to the Prime Minister. One of the key principles of the Plan is: "Protecting the poor and the vulnerable sections of the society through an inclusive and sustainable development strategy, sensitive to climate change." There are eight missions that form the core of the Plan. Water is one of the core issues dealt as a national mission under the plan. The Water Mission will focus on integrated water management and aims at increasing water use efficiency. "The Mission will take into account the provisions of the National Water Policy and develop a framework to optimize water use by increasing water use efficiency by 20

percent through regulatory mechanism with differential entitlements and pricing," read the Mission objectives. The Mission has suggested an investment of Rs. 20,630 crore till 2017 for understanding and fighting the impacts of climate change on water resources. This is besides the all other regular investments. Under the guiding principles on the water uses in a changed climate scenario, the Mission has given top priority to water needs for human health and hygiene. For other uses, it has suggested local situations, markets and other deciding factors as parameters for setting priority of uses.

The Mission has given water storage creation high importance. This is because, as the Mission documents argue, there would be high uncertainty in water availability due to the impacts of climate change. In all its key recommendations this has been the key objective. And all the recommendations and action points have been categorized into four sections: 1. Assessment of impact of climate change, 2. Changes in policies and practices, 3. Measures for mitigation and 4. Measures for adaptation. The Five-Year Planning process also adopted such a development goal. The Working Group on Water Resources constituted for the preparation of the 11th Five-Year Plan noted: "It is an accepted fact that even in the post climate change scenario, systems that are more controlled will fare better than those are less controlled. In water resource parlance, control means engineering infrastructure that enables the water managers to store and transfer water with greater certainty, thus reducing the impact of uncertainty. Therefore, dealing with climate change is going to require more infrastructures."

A few salient features or observations from the mission are as below:

Inter-basin transfers are an effective way of achieving better equity. If the transfer is from an open basin to a closed basin, increased water use is achieved. Such transfers need to be encouraged.

Water harvesting is an important method of increasing usable water and needs to be encouraged.

Larger storage and larger carry over storage become essential to increased water use. Where surface storage possibilities are low, ground water storages can be used in conjuction.

The present trends towards single purpose development are perhaps due to institutional constraints, and this needs to be overcome. The tendency of the

farmer/irrigation departments to protect the historic dominance of irrigation needs to be changed. The compatibility amongst uses for irrigation, hydro-power, domestic and industrial supplies etc. can be enhanced through innovative planning.

The current definition about the provision of adequate water supply to rural communities needs to be re-visited to remove the large disparity between urban areas with piped water in or near the residence and the rural communities.

The current practice of using groundwater for rural domestic uses should be continued. But where there is quality problem, piped surface water should be supplied using larger network.

The policy should aim at improved supply norms with flush toilet facilities in rural areas also; thus, bridging down the urban-rural divide.

Industrial water supply needs to be on a lower priority than the core demand of the domestic water supply.

Under climate change, the number of rainy days may decrease and the rain per rainy day may increase. This can reduce the deep percolation to groundwater and increase the proportion of surface run-off. Thus, the 'natural' groundwater recharge may reduce. This needs to be investigated through hydrological modeling based on short time periods.

The role of the government as a regulator of the water sector is a basic government function that needs to be strengthened through institutional design. The role should not be interpreted as a role of price regulator.

Business as usual in an unusual situation

Right to water has been accepted as an integral part of right to life. This is fundamental to overall development as well. So climate change impacts the very fundamental of the country's development. Today we face a serious crisis of source sustainability in the water sector. Climate change would further precipitate this problem. So we need not more aggressive exploitation of groundwater, but a sensible water security policy. Drinking water is already a big problem and climate change will make it worse. As we are aware lack of safe drinking water has been killing close to 1.5 million children annually in India

and triggers widespread poverty as has been admitted by the latest Economic survey. While all recent government policies advocate less use of groundwater, the Water Mission has proposed to reach to the deepest to mine groundwater. This is a threat to overall water security, and drinking water security in particular.

Civil society groups have been vociferously opposing the very tenets of the plans for water sector under the NAPCC *(See Table 1: What are our concerns?)*. Their criticisms revolve around two fundamental issues: the Mission has been designed based on the Water Policy that has been opposed and secondly, the strategy is just to create more surface water storage without factoring the learning from earlier experiences. More to it there have been concerns over the plan's not so ambiguous focus on equity in access to water, quality of water and the overall importance of water to health issues.

The approach towards water has been purely from supply side response. Currently, even government policy makers agree, this approach in water resource management needs to be changed. The failure in making provision for irrigation as per demand, reaching drinking water to rural communities and coping with the ever increasing industrial demand for water have pointed out that supply side response management is not the right way of managing the country's water sector. It is more than a decade that the mainstream discourse on water resources revolves around integrated water management with equity and access as the tenets. So the demand from the civil society groups has been to first change the Water Policy accordingly and than draft the Mission. For the formulation of a new national water policy, a detailed participatory exercise should be started immediately. The NAPCC recommends such review only in consultation with states but this process has to start from the people and would have to be aimed at a new NWP.

In the last four years there have been some interesting developments in government policies regarding water resource management. Source sustainability has been haunting the country: thousands of water structures are abandoned due to drying up or depletion of water sources. Whether in irrigation department or in drinking water department, source security is emerging as the biggest challenge. One way, water security is the single most important issue in the sector that has to be ensured. Climate change is going to threaten this security further. So ideally, a plan in water sector to fight climate change impacts has to be a water security plan for the country. The Mission, by

the singular focus on creation of more storage and use of more groundwater, is not in sync with this challenge.

As the Mission has accepted that the water sector management must take into consideration the community management, where it has failed is in bringing out a concrete charter on building the capacity of the communities to manage the sector. Traditionally communities have been managing water. And in a changed climate scenario with increasing hazards, they form the first tier of response. So their response is critical. To enable communities to do this, the Mission must deal with the institutional changes needed. Currently, the Mission plan doesn't even talk about inter-sectoral and inter-governmental integration needed to fight a crisis like climate change that impacts almost every aspect of life.

Table 1: What are our concerns?

Water Mission prescriptions	Our concerns
Consideration of precipitation as basic water resource	Must maximize use of precipitation by extensive recharge as much as possible and scattering storage through manageable and equitably distributed storage systems like small structures
Evaporation management as an important strategy	Recharge, again through small and viable structures as that of traditional variety
Appropriate entitlement and pricing	Need to review. As water becomes scarce excluded communities get further farther from water resources.
Appropriate regulatory mechanism	Review the current first; groundwater regulatory bodies
Review of water use	Must review the trend of water use – industrial use is going to more than double by 2050. Increasingly, it is being groundwater.
Further using groundwater, from 1000/1500 mts deeper	Need to curb this bad habit, recharge not enough and leads to quality problem as well.

Old problems, new concerns

In a sense, the impact of climate change on water resources and availability implies more of the same problem – drought and flood. Unfortunately the Mission has largely failed to learn from past experiences and only propagated what has largely been responsible for the growing water management crisis.

The impacts of climate change are not new to India as we have been facing drought and floods with religious regularity. The concern is the rising intensity of disasters like flood and drought. As a country we have more than 150 years of formal experiences in managing drought and floods. Despite this every time a disaster strikes us, we have been found helpless. So just imagine the situation where these disasters would be more in intensity and spread.

Generally we can fight climate change in two ways: curbing emissions of GHGs that cause the globe to warm up and by preparing the communities to fight the impacts of climate change in effective ways. The first option needs wider arrangement among developed and developing countries to work on a plan that cut down emissions; that we have been doing it for close to two decades without specific results. Cutting down emission involves crucial changes in our development models and also technology. So, it is a long term approach though critical. Even if we stop emitting GHGs now completely, the earth has enough carbon dioxide accumulated over 200 years to trigger changes in climate for the coming centuries. The next option is to empower communities to fight the impacts effectively. This is of urgent need as communities across the country are reporting strange changes in monsoon pattern and losing crops more frequently than earlier. If we don't make our rural communities secured of climate change impacts, poverty would further rise.

Template for Change

Let's take two examples of how we should or shouldn't fight climate change. Bongamunda village in Balangir district of Orissa and Hiware Bazar village in Ahmednagar district of Maharashtra are studies in contrast: the former gets around 1,000 mm of rainfall but suffers chronic drought and the latter gets around 400 mm rainfall but has been water surplus. Both the villages have been covered under drought prone areas programme for close to 50 years. The latter village had a past similar to Bongamunda. In a changed climate scenario, drought would be more pronounced for both the villages. But the latter village

has insured its future from climate change. Bongamund would continue to suffer from drought, rather more frequently.

What is the insurance of Hiware Bazar against climate change impacts? It invested heavily on water conservation in the last one decade. And it didn't ask for extra money from government to do so. The village community just used existing drought mitigation programmes to invest on water conservation. The result is that it has become a water surplus village from a water scarce village. It has created so much wealth that now people from urban areas migrate to this village for livelihood (in mid-1980s the village was virtually abandoned). By default the village has become a climate change crusader.

In contrast, Bangamunda village having access to government programmes similar to Hiware Bazar never took up water conservation. The result is that it has reached to a situation where for close to eight months everybody migrates out for livelihood. In a changed climate scenario, its future is going to be worse.

So to fight climate change impact at village level we have to ensure that the impacts are first fought out and then people develop their ways of adapting to the changed situation. As pointed out above, the impacts are nothing new that we have not managed. It is basically water conservation with the communities at the helm of affairs to make it sustainable. Simply we need to store water more so that during lean time i.e. drought we can use it for agriculture and other purposes.

We have instances of local level adaptation

Adaptation to combat drought and water scarcity: Drought results in less availability of water which in turn degrades the quality of available water as demand pressure on that significantly rises. India has vast dry areas. The communities there have developed traditional water harvesting and water storing techniques since long. But, in the face of climate change, the traditional systems too are failing to provide desired adaptive cushion. As a result, people are finding out innovative systems to boost their capacities to cope with growing water shortages.

Traditionally, Gujarat has a drought cycle of 5 years, where in 2 years there is moderate rainfall, 2 years less rainfall, and 1 year of good rainfall. But, it has been identified that the intensity and return period of major drought events

have increased substantially in last two-three decades and there are more incidences of consecutive droughts. Further, it is being projected that bouts of heavy intensity rainfall will increase. In such a background, people of Kutch region have collectively taken up rooftop rain water harvesting as an important responsibility. As a result, water level of the wells has increased.

Similarly, in the eastern state of Orissa, villagers in the Sambalpur district have found their answers to drinking water worries. In one village, all the 18 wells were used to go dry. And the tube wells were breaking down quite often. But, now all the wells have a minimum of 5 ft of water during the summer. This was achieved in just four years of community initiative to harvest rainwater through traditional water harvesting methods.

Similar, community water harvesting initiatives are also abound in arid regions of Rajasthan, Bundelkhand, Andhra Pradesh and Tamil Nadu also.

Finding adaptation to coastal erosion and salinity

Coastal erosion, sea water ingress and groundwater salinity problems are increasing in most parts of the coastal areas. Sea rise, cyclones and more powerful sea storms are increasing. This is affecting fresh water availability and worsening sanitation situation. The Sunderbans in West Bengal is one of the most affected areas hounded by coastal erosion, sea rise and frequent sea storm. People of the region have clearly felt the changing of the climate. Communities there have changed their agriculture season. And to combat surface and ground water salinity they have taken to rain water harvesting in a big way. This has increased their fresh water availability and moderated ground water salinity.

While the communities of Sunderbans have found an effective adaptation option in water harvesting, the government of Orissa has decided to use modern technology to mitigate sea erosion and sea water intrusion. It has decided to erect geo-tube wall along the coast of Pentha and Jambu in Kendrapara district areas where shore erosion and tidal intrusions have become threatening. The Goa government too is mulling the idea to use advanced technologies to mitigate coastal erosion and water salinity caused by sea water intrusion.

Guarding themselves from flood woes

In a flood situation drinking water and sanitation infrastructures suffers the most. This has again been proved from this year's flood in the Kosi and Mahanadi rivers. While major attention has gone to erect river embankments and large reservoir storages to check floods, communities too have tried to find newer adaptation measures. In flood prone Madhepura district of Bihar and in parts of Kerala, people have gratefully accepted eco-san toilets. Raised toilets have also been tried in parts of Bihar, Bengal and Kerala to combat sanitation problems in a flood situation. In the low lying coastal areas of Andhra Pradesh, communities have raised wall height of open wells to protect flood water from entering into the wells. The Orissa government has decided to raise platform levels of all tube wells in the flood prone areas of the state. These are case studies where communities have prepared themselves to adapt to a particular climate change trend. Similar adaptation stories can be found at many other places too.

Drinking watersheds to mitigate heat-stroke

Providing water to a person feeling thirsty is considered as one of the noblest thing in the Indian culture. Thus, road-side drinking water sheds – especially in the summer months - have long become a feature of the system. For states like Orissa and Andhra Pradesh however these have become more of a need than a tradition. In 1998, Orissa recorded more 2000 heat stroke casualties. Since then the drinking water sheds, especially along the roads and public places, have become a must feature in the state during summer. Further, the Orissa government has changed the office timings during summer. All the government offices, schools, colleges, etc. have to operate in the mornings only. This has helped in controlling heat-stroke casualties.

All these are however limited and sporadic examples in areas where the climate change impacts have been established over a number of years now. Many societies and development programmes are yet to recognize climate change as a threat to sustainable development and hence a systematic approach to mitigation and adaptation is missing. Political will and development mainstreaming are the needs of the hour.

There are a few other interesting case studies that show the way to insure the water sector from climate changes. Brief descriptions of them are as below:

Suda: 24X7 security

Suda is an uncommon village in Madhya Pradesh's drought prone Chattarpur district. Probably it is the first village in the district where a 24X7 water supply scheme is functional since last two years. During the severe drought in 2007-08 the village had drinking water for all the residents. The scheme is community managed and was initiated by an NGO called Haritika. The total cost of the project was Rs. 3,29,000 out of which the community contribution was Rs. 16,000. Each of the village resident gets around 70 litres per day through the scheme, which is almost double of the national norm of 40 litres per capita per day.

Sheela, a 29-year-old resident of the village, is elated. "Even people in the city cannot imagine getting water all day round." She has not forgotten the kilometers long march everyday to get a bucket of water. "It was a torturous journey everyday despite the fact that the village located in the downstream of a big tank (Jagat Sagar Tank). Wells and tubewells would dry up in face of low rainfall. Anyway the summer four months were always difficult in term of drinking water availability," she remembers. It was the same story for the 35 fisherfolk households that inhabit this village.

It is in July 2007 workers of Haritika landed in the village with a dream to sale: a 24X7 water supply scheme, on face not a feasible proposition as drought is chronic for the district. "No one ever thought that they were actually going to help us in providing water at our doorsteps and so no one came forward to help them," recalls Sheela.

But Haritika had its calculation ready to show. One calculation of Haritika showed that the average rainfall of 700 mm gives the village more than three times water than its demand. "Due to poor management systems of stopping and utilizing the rainwater properly, about 80 per cent of rainwater flows unused," says Avani Mohan Singh, secretary of Haritika. It was compounded by water intensive crops that had a direct impact on the groundwater level. It also impacted the overall availability of drinking water. "Such human and natural activities result in groundwater depletion and result in drought," says Singh. The village's ecology was also highly degraded. That is the reason why the tank couldn't be used as a recharge source for groundwater as it silted up due to soil erosion from its catchment.

However, Haritika got the first flush of support for this community water supply scheme from women who suffered water crisis the most. The village formed a Village Water and Sanitation Committee to implement and manage the scheme. The committee consists of all water users, in a way a part of the Gram Sabha (assembly of all electorates in the village). In September 2007 the scheme became functional not only with a water supply scheme but also with bathing and sanitation complex in each household. "The scheme was possible because the local community thought it as a last opportunity in face of consistent drinking water problem. The inclusion of sanitation in the scheme got us unequivocal support from women," says Singh.

The water supply scheme has triggered a chain of changes in the village. "Potable drinking water at one's own house is the first benefit. But it also changes the overall hygiene situations," says Geeta, another village resident. The time she saves in not venturing out for water means more time for children education. It also means that she can save on health expenditure incurred due to lack of safe water.

Though the scheme depends on groundwater, the village water and sanitation committee has taken up extensive ecological regeneration works to conserve more rainwater as well as recharging the groundwater. During the drought of 2007-08, the committee was active in equal distribution of water. Given the water crisis seen in the Bundelkhand area, it was a rare sight.

Laporiya: Think tank

Nine droughts in the decade of 1997-2007 and still Laporiya doesn't need a water tanker. Its wells have enough water for drinking purpose. Its soil has enough moisture to support a good harvest of fodder to sustain a livestock population that yield Rs. 37 lakhs a year from milk sale. Laporiya, a village located in the Dudu block of Rajasthan's Jaipur district, got a good monsoon of 700 mm in 1997 and since then the rainfall ranges from 100 to 238 mm. The village continues to make headlines year after year as the only village in the district that did not require aid in the form of water tankers for drinking purpose when all the nearby villages suffered from lack of water. Over 189 families of this village have traveled from drought and thirst to self sufficiency by reviving traditional rainwater harvesting systems. And on the way, it has inspired 250 more villages to take the same path to a drinking water secured future.

The village, once well networked with traditional water harvesting structures, slipped into an abyss of ecological degradation. After Independence embankments of its most reliable water source the Ann Sagar breached. And nobody cared to repair it for next 20 years. Being the main recharge point for numerous dug wells used for drinking purposes, it impacted overall groundwater level. Gradually the village became water scarce. "In spite of there being rain, the land was completely dry. There was no moisture in the soil. All rainwater ran off into the river," says Laxman Singh, president of Gram Vikas Nav Yuvak Mandal (GVNYM), an NGO which worked on the revival of traditional water bodies. By 1970s, government officially described the village as "barren with highly saline landscapes and denuded pasturelands, capable of producing only one low-value monsoon crop". During summer months, 40 per cent of the population migrated to the cities in search of jobs and, due to lack of fodder, some 75 per cent of livestock moved to nearby states. It suffered drought and an acute shortage of drinking water. In 1991 the groundwater level dipped to more than 60 feet[xvi].

In 1991, the village began digging 50 new wells, three large natural tanks, and a unique dyke system called the *"chauka"* to capture rainwater in pasturelands. The number of tanks excavated in the village and surrounding areas in 1991 alone was worth Rs. 2.5 million. The first impact was felt in availability of drinking water. The village for the first time got drinking water round the year. Water table levels in the village have risen to just 15 feet below the surface, from a depth of 60 feet in 1991, says Singh.

Its 100-odd wells got back life – the major sources of drinking water. Within the next four years the village had ensured drinking water security. Add to it the unbelievable impacts somewhere else. Availability of water ensured a bumper harvest. Villagers grew wheat in Laporiya for the first time in 20 years. The amount of irrigated land area increased to 741 acres (300 ha) and the village's agricultural production increased more than 12 times. Laporiya's efforts to conserve land and water are an integrated and multi-pronged approach that requires villagers to make interventions and changes at every step.

The restoration process had its own share of problems, mostly opposition from influential people of the village who encroached upon common lands. These common lands also form the crucial catchments for many traditional water harvesting structures. The key problem was the decline of the village

institution like the Panchayats. In a way there was no governance system in existence when the revival process started. So the first thing the village elders did was to organise residents into village committees and then to strengthen the constitutional Panchayats. "Gram Samitis (village councils) were set up by villages, and a people-centered system of governance and decision making was established. Once the village councils had established, they began to organise villagers around the tradition of voluntary community labour," says Laxman Singh.

Laporiya model is now being adopted in 200 neighbouring villages in Rajasthan ensuring drinking water security to some 42,000 families. The GVNYM has initiated training for village youth in water conservation and management. GVNYM has initiated drafting blueprints of the agricultural and pasture lands in these villages. These blueprints are basically an integrated water resource management plans for the village that ensure drinking and irrigation water security. According to recent estimate at least 40 villages have moved out of government status of 'drought-prone'.

Hiware Bazar: Blessing of being arid

Hiware Bazar village in semi-arid Ahmednagar district of Maharashtra is regarded as one of the few villages in the country that takes up annual water budgeting. And it has been doing water budgeting since 2004. In the last five years, the village found that it attained a milestone: it is now drinking water secured. "I don't think in future we are going to see any challenge to this security in our village," says Popat Pawar, the leader of the village and who played a key role in implementing the water budgeting. The district's groundwater department is a key partner in the village's tryst with water security. It has been more than a decade that the village stopped having seasonal drinking water problem. In 2006 the village had surplus water, enough to sustain another Hiware Bazar.

At a point of history the village was a prosperous trading centre of the Maratha rulers. Its fate took an ugly turn after the 1972 drought, one of the worst of the 20th century. First forest vanished. It triggered soil erosion and groundwater depletion. Traditional water harvesting structures collapsed. It impacted drinking water availability and irrigation. There was virtually no water after the monsoon. "Drinking water was fundamental to survival but there was no water at all," remembers Pawar. The impacts of droughts were also becoming severe,

compounded by the ecological degradation. "Earlier we could get some water in wells during a deficit rainfall. But later on that was also not happening," says Pawar.

In 1989 the village took the first step towards water security by adopting an integrated model of water management. The village used all available government programmes money. But it retained the decision making power with the village institution that had representation from all electorates. The village institution also made voluntary labour participation by residents mandatory. To begin with the village regenerated the 70 Ha of village forests, the catchment for the wells. Then the village with government money and voluntary labour participation built 40,000 contour trenches around the hill to conserve rainwater and recharge groundwater. During 1995-2005, the village invested all its development money on water conservation. The 70 ha of forestation helped in treating the catchments for most of the wells, 414 Ha of contour of bunding stopped run off and saved farms from silting, and around 660 water harvesting structures of various types captured rainwater.

"In early 1990s, we started having water in the wells for more than eight months. The impact was immediate after our conservation works," remembers Pawar. By 1995-96, the village got drinking water throughout the year from local sources. The water table has gone up in village wells. With rising water level, the number of wells has also gone up – from 97 in 1990 to 217 in 2007. The village also reaped a rich harvest in increase in agriculture income. In 2006 the income from agriculture was Rs. 247,84,000.

Every year, the village measures the total amount of water available in the village, estimates its uses and then prescribes the agricultural cropping pattern to be taken up. The idea is to strike a balance among all water uses. "The village decides on the crops to be grown consensually," says Shivaji Thange, who works with the village watershed committee. After five years, the village was able to identify its average water availability. It is estimated that with 400 mm of rainfall, Hiware Bazar is self-sufficient. It receives an average rainfall of 350 mm to 400 mm, experiencing a shortfall of 50-80 million litres. Realizing this handicap, the *gram sabha* has banned borewells.

"The audit begins with monitoring the groundwater level of the six observation wells identified in the village, along with the amount of total rainfall received measured by the village's three rain gauges. The sum of rainfall

and groundwater is the water available," explains Ramesh Bagmar, assistant geologist with the district groundwater department. The *gram sabha* then budgets water for the village. Water for drinking (for humans and animals) and other daily uses gets priority. Seventy per cent of the remaining water is used for irrigation. The remaining water is used to recharge groundwater.

In 2006, the village received 549 mm of rainfall and had a surplus of 1,465 million litres of water, which encouraged them to take up wheat on 100 ha of land and jowar on 210 ha. However, in 2007-08, the village only received 315 mm of rainfall and registered a deficit of 456.3 million litres. The gram sabha had decided to reduce the land for jowar to 2 ha and wheat to 70 ha.

"This water audit has been very useful in ensuring sustainability of both agriculture and water available for drinking purposes for humans and livestock in the village," says Pawar. During 2003-04, there was a drought in the district and there was a drinking water scarcity. Hiware Bazar was the only village in Nagar block, which did not need tankers. "That year, our village did not cultivate any major crop like wheat, bajra and had to switch to drip irrigation for crops like tomatoes and onions," Pawar says.

Bihar: safe water during flood

In Bihar, a sizeable section of people living in flood- prone areas have a peculiar problem—excess water during floods and yet not a drop to drink. Not only are people rendered homeless every monsoon, they also face acute drinking water shortage. It was to address this problem that the Megh Pyne Abhiyan (cloud water campaign) was started a year ago. The objective was rooftop rainwater harvesting for people seeking shelter on higher ground during floods.

At such times, inaccessibility to safe drinking water and sanitation are two key problems areas.

Launched in north Bihar, the campaign was an attempt to convince people to practice rainwater harvesting. A group initiative launched by four NGOs—Samta, Kosi Seva Sadan, Gramyasheel and the Gogardiha Prakhand Swarajya Vikas Sangh—it was brought together by Eklavya Prasad, who believes in natural resource management.

He says "Till now, there has been no effort to equip villagers with skills for using local resources. Most of the intervention is concentrated on providing external conveniences to people. This has made them completely dependent on the state."

The Delhi-born Prasad first identified the fundamental problems in flood-prone north Bihar. The state-built embankments near rivers did little beyond providing an elevated area for people to shift to during floods. But with humans and livestock under the same roof and in the absence of proper health and sanitation facilities, villagers had to endure inhuman conditions three months a year. Access to safe drinking water has been an annual problem during monsoons.

According to Prasad, government agencies and ngos have been addressing the problem by providing water purification tablets and installing shallow handpumps on the embankment. But this was not a solution since the tablets did not reach everyone on time and often the pumps delivered impure water. As a result, people became vulnerable to water-borne diseases.

Thus was born the concept of rooftop rainwater harvesting to access safe drinking water during floods. The displaced on the embankments and other elevated zones stay in temporary shelters made of polythene sheets. These became tools to save water, says Prasad. The rainwater falling on the sheets are channelled and stored in a container. In its first phase, the Megh Pyne Abhiyan is targeting about 46,000 people.

Raj Samadhiyala: The reaper

In 2002 Raj Samadhiyala village in Gujarat's Rajkot district got around 80 mm of rainfall, less than that of India's lowest rainfall receiving areas (for example, Barmer in Rajasthan). It was also the severest drought year for the state. But residents of Raj Samadhiyala were least worried. It was business as usual with all the wells in the village having water. The village's water supply scheme was supplying water for close to eight hours a day. "Ours was probably the only village in the state that didn't report a single outmigration," says Hardevsingh Jadeja, the community leader of the village.

Raj Samadhiyala is an example of integrated water resource management backed by good water governance that resulted in impeccable drinking water security. It is more than 15 years that the village got drinking water through tankers, a staple for neighbouring villages even now. This is also a village that has been taking up three crops a year using the harvested rainwater and irrespective of droughts. In 2002 the village had three crops with annual earnings of around Rs. 30 lakhs while the state reported 60 percent crop loss. For the last 30 years (1978-2008) the village has been harvesting rainwater.

Raj Samadhiyala was a severely water scarce village in 1970s. Village women used to walk five to seven kilometers for fetching drinking water. With rain or not, water scarcity remained the biggest problem. An irregular water tanker was the only hope for getting water at the village. Its groundwater level dipped to 250 metres below surface. "Forget about agriculture, people didn't have water to drink as wells dried up," says Jadeja.

But in 1978 the village's fate took a magical twist. It took up extensive rainwater harvesting programme, established a village development committee that took over water management in the village and laid strict rule for water use. The village level institution takes decision on water management, its finance aspect and also ensures people participate in its overall management. This institution doesn't replace the Panchayats but works as an advisor and has emerged as the most participatory village body. To start with, the village development committee planned out in detail on how to harvest the 500 mm average rainfall it gets for optimal uses.

During 1978-2003, the village through its village development committee spent Rs. 2.5 crore government programme money from District Rural Development Agency (DRDA) in water harvesting. The village built 45 check dams, percolation tanks and farm ponds over an area of 1090 hectares. It has directed running off rain water into extensive sub-surface percolation structures using satellite maps that indicated old dried water channels. To treat the catchments, the village has planted 60,000 trees that help regulating water runoff thus making water conservation more effective.

In 1992 the village stopped getting water through tanker. All the water conservation works resulted in recharging of groundwater – water level has gone up from 250 metre in 1985 to 15 metre in 2004. A 70 feet deep well, earlier completely dry, is now exclusively used for supplying drinking water to 300

households. The well has 60 feet of water, even when monsoon fails. Water is pumped to a surface tank and from there supplied to households through taps. "There is not a single default in water tax payment," says Jadeja. The village has now 14 wells that have perennial water for drinking purpose i.e. seven times more water availability than in 1985.

"Despite such high water uses, we still recharge more than we extract. That is the result of our local water security plan," says Jadeja. The village's recharge rate is a whopping 125 per cent. It seems that the village has reached to a sustainable level where its groundwater recharge and surface water use have struck balance. "I don't see any reason why we will ever have drinking water problem. Though sustainability is a major problem for several villages," he says.

How is the government is moving?

When Mumbai sank after unprecedented heavy downpour in 2006, the debate surfaced as to how our urban planning and infrastructures woefully lack ability to face disaster of a higher kind. The same thing happens after every major disaster and most activities die down after the initial relief and rehabilitation measures. Disaster management has become a key development challenge now even as its link with climate change is yet to be recognized by the development actors.

Climate change itself does not happen in isolation. It is the cause and consequence of activities and happenings attributable to other factors which are more easily recognizable. Adaptation measures are seldom undertaken in response to climate change alone but can be integrated within, for example, water resource management, coastal defense, and risk reduction strategies.[xvii] Thus the challenges to mitigate climatic changes or find suitable adaptation are not that simple. In such circumstances, combating climate change becomes more a macro problem than a micro problem. Thus, many experts feel that the initiatives have to come from the top, especially at the initial stages. Hence, how the government and the policy makers are moving holds quite important.

The government of India estimates its current expenditure on adaptation to climate variability to be in excess of 2.6 percent of the GDP and nearly 13 percent of total budget expenditure, with agriculture, water resources, health and sanitation, forests, coastal zone infrastructure and extreme weather events, being specific areas of concern[xviii].

As part of the efforts, the governments have taken various measures to conserve rainwater; improve quality of rivers and important water sources; increase forest cover from the present 21 percent level to at least 32 percent by 2012; protect coastal areas through coastal management; change cropping and land use pattern; early climate information dissemination and comprehensive insurance cover etc. In addition, the government is giving considerable importance on ground water recharge and management. Ground water accounts for nearly 40 percent of the total available water resources in the country and meets nearly 55 percent of irrigation requirements, 85 percent of rural requirements and 50 percent of urban and industrial requirements. Some other important programmes of the government are Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP), and National Watershed Development Programme for Rain fed Areas (NWDPRA), Soil, Water and Tree Conservation (Operation Soil Watch), and the Operational research projects on Integrated Watershed Management. All these programmes had definite objectives: improvement of productivity of catchment areas, optimum use of soil, land, water and their conservation, employment generation, etc[xix]. These adaptation programmes have been mainstreamed through some broad programmes aimed at drought proofing, water management, coastal protection, health, disaster management and glacier management etc.

While most of the government's programmes and schemes are aimed at providing adaptation avenues, some programmes aim at mitigation of climate change. Pollution control, forest enhancements and being important stakeholder in the Clean Development Mechanism (CDM) are part of that.

While all these programmes have tried to mainstream issues relating to climate change with them in various forms and scales, some other flagship programmes in water and sanitation like the Bharat Nirman Yojna, the National Rural Water Supply Programme, the Jawaharlal Nehru National Urban Renewal Mission and the Total Sanitation Campaign haven't quite mainstreamed climate change issues and concern. Those programmes are focusing more on meeting the present requirements rather than envisioning future climate change challenges.

The present focus of major programmes is on creating assets. India government has spent about Rs.117,583.4 crores for water and sanitation till

the 10th five year plan (2002-07) period.[xx] But even with such heavy investments, nearly 14 percent of rural population still lack drinking water access and nearly 80 percent still lack access to improved sanitation. More and more habitations are reporting slippages due to reduced water availability or quality problems. That underlines that our drinking water and sanitation initiatives haven't been very sustainable. That also underlines that in the face of climate change uncertainties, such infrastructure will face more sustainability pressures.

The major problem as of now is that though many of the government programmes do touch on climate change issues, they have seldom been planned to provide mitigation and adaptation from climate change. The government did not have any comprehensive action plan aimed at meeting climate change challenges. The National Climate Change Action Plan is the first major government initiative that aims to provide much needed direction to climate change mitigation and adaptation mainstreaming. The 'National Action Plan on Climate Change' maintains that in view of the large uncertainties concerning the spatial and temporal magnitude of climate change impacts, it is not desirable to design strategies exclusively for responding to climate change. Rather, the need is to identify and prioritise strategies that promote development goals while also serving specific climate change objectives. Thus, the NAPCC has first given more thrust on studying local level climate change observations, projections and implications. The eight missions envisaged in the NAPCC are meant for that. Out of those eight missions the Water mission, the Sustaining the Himalayan eco system mission and the Sustainable Agriculture mission are directly related to water sector. The national water mission is mandated to study and find out key areas relating to climate change's impact on water resources and make clear local level hydrological projections so that water adaptation and mitigation can be effectively mainstreamed into various development programmes. A key part of the national water mission is to study surface water flows in details.

To be climate change neutral

India can virtually insure its every village from climate change without any extra cost. The instrument is the National Rural Employment Guarantee Act (NREGA). It guarantees 100 days of manual jobs to those who demand for it. Using this employment the Act creates village assets, mostly water conservation and drought proofing works. More to it, it mandates a village to plan its development and seeks works that would be suitable for the village

situation. Since its inception in 2005 more than four percent of India's population has worked under the Act, mostly poor. In the last three years more than 2.8 million water conservation and drought proofing works have been undertaken under the Act. At an average each village has created six water conservation structures. There are reports of such structures ensuring good agriculture despite constant drought. There is increased water level in dug wells and check dams. Many villages in drought prone areas have reported second crop for the first time using the harvested water.

Hiware Bazar village used funds from a similar programme in implementation in the state since early 1970s for water conservation. However, there are also reports of official-contractor nexus forcing villages to agree for road construction. The wage structure is such that people get less money for working in water conservation works than in road building. One way, there is no incentive to work in productive village assets that will insure people from drought.

The idea, or a pressing change in government outlook, is to turn the NREGA into a climate change security tool. People are aware of the changes in local climate and its impacts on their livelihoods. Use the mandatory village plan provision for communities to identify problems and solutions for it. Bring in incentive in terms of high wage rate for taking up water conservation and drought proofing works. This needs minor changes in the wage guidelines of the Act. This will make people earn more while ensuring their village climate change secured. The change we need now is to make every rural Indian a climate change crusader. We need the change now.

A charter for change

Debate and discussion continue over the plan of action for the water sector to fight climate change. We believe that the below points would be useful while drafting a strategy:

1. A national action plan on water sources vis-à-vis climate change must make water security as the overarching objective
2. The action plan must work towards ensuring water security for the most marginalized and excluded community.
3. Priority must be given to use the existing infrastructures and budget must be made available for the same before the government embarks on creation of new provisions.

4. Current government programmes must be fine tuned to climate change impacts and the new reality demands a new thinking. So, while climate change plans are being evolved there must be widespread discussion with all sections of the society.

5. Communities must be brought in front of the climate change mitigation and adaptation majors. Their experiences, knowledge and visions must be factored in national climate change plans.

6. There has to be a national priority list for water uses but decision over it must be decentralized and must be done at the community level. It has been observed that community regulation is more effective than centralized and legislated regulation of water uses.

Major uncertainties

Large uncertainty exists to how surface water and groundwater quantities can be expected to change with climate change. This is as a result of the uncertainties in precipitation projections and the difficulty in quantifying effective rainfall. Whether there will be an increase or decrease in effective rainfall, with increased intensity and irregularity of rainfall and a higher evaporative demand is very unclear.

A further key uncertainty to the realised change in surface and groundwater quantities, is what partitioning of effective rainfall can then be expected within a climate of more intense rainfall, higher evaporative demand and increased soil degradation. i.e. will it be surface water resources or groundwater resources that will experience the greatest change in quantity? Whether degraded soils will facilitate increased groundwater recharge, or greater surface runoff, is critical to the partitioning of net rainfall in South East Asia and South Asia, but also a key unknown. Whilst more intense rainfall can lead to increased groundwater recharge, particularly in semi-arid regions with permeable soils, it is also possible that increased temporal variability of rainfall will lead to greater soil crusting and soil degradation, such that overland flow increases and groundwater recharge decreases (Döll and Flöerke 2008).

Predicting the change of groundwater quantity is very difficult when we have extremely little data with which we can estimate the present quantity of groundwater resources. Data is urgently needed to fill this gap. Predicting the effect of groundwater quantity change to WASH is also therefore very difficult.

CC is not happening in isolation and changes in water availability are likely to be much greater than that predicted from CC. Population growth, socio-economic development, land use change and rising food demands are much bigger threats to future water resources

Water in the Negotiation Process

Adaptation negotiations are taking place under the United Nations Framework Convention on Climate Change (UNFCCC). Specifically adaptation is discussed under the Ad Hoc Working Group on Long Term Cooperative Action (AWG-LCA), the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific & Technological Advice (SBSTA).

- SBI – in relation to adaptation, the SBI is reviewing progress under Article 4 of the Convention with a specific focus on paragraphs 8 & 9 and Decision 1/CP. 10. These include issues related to assessing the adverse effects of CC on developing countries; assessing the impact of the implementation of response measures and assessing how best to support concrete adaptation measures. Also relevant to adaptation, the SBI focuses on the financial mechanism for the UNFCCC, including the Least Developed Countries Fund and the GEF review.
- SBSTA – the SBSTA is reviewing the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP). The NWP is a 5 year programme, which is going into its second phase (focusing on implementation). The SBSTA is discussing in particular: what aspects and learning from the first phase should be taken up by the SBI and what the role of the NWP should be in the future (i.e. how should the NWP inform Parties on adaptation related issues?).
- AWG-LCA – the AWG-LCA is a subsidiary body under the Convention which has been tasked with presenting an outcome (by 2009) on 'long-term cooperative action' that will enable the full, effective and sustained implementation of the Convention beyond 2012. Under the AWG-LCA there are 3 contact groups that focus on: 1. Developing a Shared Vision on Adaptation; 2. Means to Implement Adaptation; and, 3. Enhancing Financial and Technical Support for Adaptation.

What's Being Negotiated?

- Currently Parties are negotiating the development of a Framework for Adaptation. Components of this framework include: 1. Creating an enabling environment; 2. Risk reduction; and, 3. Economic diversification.
- Current negotiations are at a stand-still due to a deadlock on aspects related to creating an enabling environment. Parties are yet to agree on how best to define adaptation, to carry out vulnerability assessments

and to scale up support for adaptation, specifically financial support. While there is some agreement that the definition of adaptation will vary across countries and scales and that vulnerability assessment will include criteria like risk exposure and coping capacity, there is little agreement on defining the scale of support required for adaptation and the means to mobilise and deliver this support.

Where is Water in the Negotiations?

- Water has been identified as one of the most vulnerable sectors to CC. The IPCC has produced a technical paper on water and CC (the first sector to receive solo attention). Water-related projects dominate the priority projects identified under the NAPA process. The Global Environment Facility (GEF) Trust Fund also identified water as a key ecosystem requiring adaptation support.
- The negotiations themselves have not gone into details related to adaptation in various sectors. However, at the last two Conference of Parties (in Poznan 2008 and in Bonn 2009), 2 side events, organised by NGOs, focused on water and CC. The Global Water Partnership is planning to host a ministerial meeting at the next CoP to ensure that water is included in the Copenhagen Deal.

Engaging with the Negotiations

There are a number of ways to engage with the negotiations. Formal engagement includes the submission of

- statements to the Secretariat, which are then considered by the Parties and organising Ministerial events to ensure that a particular topic is brought onto the negotiation agenda. Informal engagement includes discussions with delegates, which can then be reflected during the negotiations.
- In terms of areas of engagement, experiences from the water sector can feed into a number of existing adaptation streams. For instance, under the theme related to 'developing a shared vision on adaptation', the water sector could highlight the role of water in facilitating adaptation and provide clarification on whether water should be seen as a sector on its own or as a cross-cutting resource. Under Means of Implementation, the water sector has a lot of experience related to vulnerability and adaptation assessments (see Household Water Economy Assessment (HWEA) below) and could inform debates on 'economic diversification'.

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5. Climate change and forest communities with special reference to Orissa

Ranjan K Panda

Introduction

Different scientific models growingly confirm that climate change is going to exert significant pressure on forests around the world in the coming century. While no certain figures of the magnitudes of the projected temperature rises and precipitation changes are yet to come, the devastation climate change will induce in ecological, economic and socio-cultural lives of the forest communities are surely going to be too enormous. Tropical forest ecosystems around the globe, particularly the ones on which the livelihoods of people from several regions of the world depend, belong to the most vulnerable ecosystems to climate change variability and long term changes in temperature and rainfall (CIFOR, 2007). Many of these humid forest ecosystems that are occupied by indigenous peoples have seasonal climates. In many cases climate change may result in longer dry seasons. A vicious cycle of climate change and deforestation could wipe out or severely damage nearly 60 percent of the Amazon forest by 2030, deforestation in the Amazon could release 55.5 to 96.9 billion tonnes of CO_2 to 2030, which is equivalent to more than two years of global greenhouse gas emissions. Global warming is, in fact, likely to reduce rainfall in the Amazon by more than 20 percent, especially in the eastern Amazon, and local temperatures will increase by more than two degrees centigrade, and perhaps by as much as eight degrees centigrade, during the second half of the century.

Ranjan K Panda, Secretary of MASS; Convenor of Water Initiatives-Orissa and Combat Climate Change Network

The impact of climate change on forests and on forest dependent people in India are already evident in increased incidences of forest fires and outbreaks of forest pests and agro-ecosystems (crops, livestock and grasslands) forests and woodlands, inland waters and coastal and marine ecosystems, according to Diouf D.G. FAO. The effect of climate change on forests, forest-dependent people and environmental conditions was already evident. Nearly 88 million tribal and indigenous people depend heavily on forests for food, fuel and fodder. Increase in temperatures will result in shifts of lower altitude tropical and subtropical forests to higher altitude temperate forest regions, resulting in the extinction of some temperate vegetation types. Decrease in rainfall and the resultant soil moisture stress could result in drier teak dominated forests replacing trees in central India. Increased dry spells could also place dry and moist deciduous forests at increased risk from forest fires. There is growing scientific evidence that climate change will increase the number and size of wildfires, both globally and in North America. The effects of climate change on wildfire occurrence, extent, and severity will vary in different regions of the country.

Climate change is initiating and speeding up the vicious circle. Today, carbon from forest conversion to cattle pastures and agriculture in the Brazilian Amazon is seeping into the atmosphere at a rate of 0.2 to 0.3 billion tonnes per year. This number can double when severe drought increases forest fires. Indigenous peoples of the tropical rainforest are dependent on the forest. Many of them are already today affected by the impacts of environment and climate change are struggling to adapt to the changes in the environment. Most of these people are hunters-gatherers. (e.g. the Dayak of Borneo, the Papuans of New Guinea, Amerindians in South America, Pygmies of the Congo Basin etc.) Most of these hunting and gathering communities are gradually adapting their lives to an agricultural economy and are becoming increasingly semi-sedentary. In many cases indigenous people have developed specific coping strategies to extreme variations of weather. And while doing so they have been trying to shift to agrarian economies and modern farming systems that cause further damage to the forest ecosystem and alienate the people from their resources, thereby socio-cultural degradation that further erode the values of conservation. So, the forest communities world around are crushed in a condition of no return and turn out to be climate's refugees.

The Indian Scenario

India is a mega-biodiversity country where forests account for about 20% (64 million ha) of the geographical area. With nearly 200,000 villages classified as forest villages, there is obviously large dependence of communities on forest resources. Approximately 20 percent of the 64 million ha of India`s geographical area is forested under 16 major forest types, from alpine pastures to dense tropical forests possessing amazing biodiversity. More than 5,150 plant species, 16,214 insect species, 44 mammals, 42 birds, 164 reptiles, 121 amphibians and 435 fish species are endemic to India`s forests. In India, studying the likely impacts of climate change on forests should be a major point of discussion. However, there are not much of comprehensive studies available that dissects the science of climate change for understanding of the lay person and especially the forest communities. As such also, study on the impacts of climate change on forest communities are found in very limited numbers. Studies conducted by senior scientists at the Indian Institute of Science (IISc) located in Bangalore have have predicted a major shift in India's forest types due to the increased temperatures and variable rains, especially on tropical dry forests, moist and dry savanna such as in the Biligiri hills. This shift may lead to large scale loss of forests and biodiversity, even though net primary productivity of forests may increase for a period before becoming unsustainable for forest communities in the long term due to forest-loss. IISc professor and chairman of its Centre for Ecological Studies, Raman Sukumar has projected serious consequences for a wild, rare goat called the Nilgiri Tahr, if exotic weeds invade the montane grasslands of the Western Ghats. But while some beginnings in scientific conclusions on impacts of climate change on flora has been made, there is practically no attention still on faunal populations in parks and sanctuaries. "Climate projects at regional level are not robust, though global warming projections are healthy", says IISc professor N.H. Ravindranath who is also chairman of the Centre for Sustainable Technologies (CST) at IISc." Research methods are still evolving, mainly because models for prediction are very complex", he explains.

The national communication report (NATCOM) of India confirms the above figures and predictions by scientists of IISc. It admits that in India, about 200 million people depend on forests directly or indirectly for their livelihoods. Forests meet nearly 40 per cent of the country's energy needs and 30 per cent of the fodder needs. It is estimated that about 270 million tonnes of fuel wood, 280 million tonnes of fodder, over 12 million m^3 of timber and several Non-

Timber Forest Products (NTFPs) are removed from forests, annually. In India there are about 15,000 plant species out of which nearly 3,000 species (20 per cent) yield NTFPs. NTFP activities hold prospects for integrated development that yield higher rural incomes and conserve biodiversity, while not competing with agriculture. Millions of forest dwellers and agricultural communities depend on forests for a range of non-timber forest products, such as fruits, nuts, edible flowers, medicinal herbs, rattan and bamboo, honey and gum. Further, all forest sector activities are labour intensive and lead to rural employment generation. The value of goods and services provided by the forest sector is estimated to be Rs.25,984 crores of the GDP of Rs.23,000 crores.

The NATCOM, using several parameters, has tried to project vulnerability of forest ecosystems to climate change. Using several models the NATCOM has tried to predict different scenarios and changes in forest ecosystems under those. However the scientists engaged with NATCOM too have not been able to provide any concrete projection of climate change and its impact on forest ecosystems in India. However it also warns of severe consequences. While they find their models projecting changes along the lines expected, on the basis of increase in CO_2, as well as the changes in rainfall and temperature, in general, increased CO_2 is expected to lead to an increase in the Net Primary Productivity (NPP). This has an effect of converting grassland into woodlands and woodlands into forests. Thus, in regions with a relatively large temperature increase, dry and moist savannas are likely to be replaced by xeric vegetation, while in the areas with a lower temperature increase and enhanced rainfall, the moist savannas seem to be transformed into Seasonal Tropical Forests. However, the northern part of the country has largely been transformed into agricultural land and thus the savannas occupy only a small geographical area. The other biome type to be affected is the moist savanna located in the north-east and some parts of southern India. This is likely to be converted into Tropical Seasonal Forest (about 56 per cent), mostly in the north-east and Xeric woodland (Dry Thorn Forest) (about 32 per cent) mostly in southern India, depending on the change in the quantum of rainfall. The Tropical Seasonal Forest, especially in the northeast, is likely to change into Tropical Rain Forest due to a large increase in rainfall expected to take place in that region. The changes expected in the colder regions are also along similar lines, with the Tundras likely to change to boreal evergreens, and boreal evergreens into temperate conifers.

Overall assessments of various reports including the NATCOM confirm that climate change is in fact going to impact the ecological, economic and socio-cultural lives of the forest communities. These changes can be largely attributed to the shift in the forest biomes. As the NATCOM points out, even in the relatively short span of about 50 years, most of the forest biomes in India seem to be highly vulnerable to the change in climate. This is drawn from the sample sites it has studied. According to it, about 70 per cent of the vegetation is likely to find itself less optimally adapted to its existing location, making it more vulnerable to the adverse climatic conditions as well as to the biotic stresses, which it is subjected to from time to time. As a result, during the process of take-over of one biome type by another, large-scale mortality might be expected. The actual negative impact may be more than what is initially expected from the above description. This is because different species respond differently to the changes in climate. So, even in the region where there is no shift in the biome type, changes in the composition of the assemblages are certainly very likely. Thus, one expects that a few species may show a steep decline in population and perhaps result in local extinctions. This, in turn, will affect the other taxa dependent on the different species (i.e., a 'domino' effect) because of the interdependent nature of the many plant-animal microbe communities that are known to exist in forest ecosystems. This could eventually lead to major changes in the biodiversity. The north-western region of the country seems to be more vulnerable to climate change, since it is likely to experience the effect of two negative influences: a large temperature increase together with a decrease in precipitation. The vulnerability of the north-eastern region stems from a very different cause. The major increase in precipitation expected in this region is likely to shift the vegetation towards the wetter, more evergreen vegetation. Since these are rather slow growing, the replacement will take much longer, and increased mortality in the existing vegetation may lead to a decrease in the standing stock.

The State of Forest Report 2003 says 16 major forest types, from alpine pastures to tropical savanna cover 67.8m ha or 20.64 percent of the country's geographical area, with 1.56 percent very dense forests, 10.32 percent moderately dense forests and 8.76 percent open forests. The projected changes in these forests are principally due to increased temperatures of 2-4°C in the southern region and possibly exceeding 4°C in the northern region. Rainfall days are set to decrease in general, but its intensity will increase, as per the NATCOM. Nearly 68-77 percent of Indian forests are likely to undergo a sea change to another forest type by 2085. "In other words, over half of the

vegetation is likely to find itself less optimally adapted to its existing location, making it vulnerable to adverse climatic conditions and to biotic stresses," states the paper "Impact of climate change on forests in India" by N. H. Ravindranath et al published in 'Current Science'. To understand in a common man language, there will be wetter forest regions in the northeast and drier forest regions in the northwest.

Climate change will happen faster than projected

The above analysis is what government reports and reports that have fed the scientific papers say. Climate change, as United Nations Environment Programme (UNEP) has warned, may impact much gravely than the levels expected at the moment. To advocate governments towards taking firmer steps in the December 2009 Copenhagen Summit, the UNEP has released the Climate Change Science Compendium 2009. This report argues that the pace and scale of climate change may now be outstripping even the most sobering predictions of the last report of the Intergovernmental Panel of Climate Change (IPCC). In a UN release, Achim Steiner, UN Under-Secretary General and UNEP Executive Director, said, "The Compendium can never replace the painstaking rigour of an IPCC process – a shining example of how the United Nations can provide a path to consensus among the sometimes differing views of more than 190 nations". "However, scientific knowledge on climate change and forecasting of the likely impacts has been advancing rapidly since the landmark 2007 IPCC report," he added. "Many governments have asked to be kept abreast of the latest findings. I am sure that this report fulfills that request and will inform ministers' decisions when they meet in the Danish capital in only a few weeks time," said Mr. Steiner. This report points out that some scientists are now warning that sea levels could rise by up to two metres by 2100 and five to ten times that over following centuries. There is also growing concern among some scientists that thresholds or tipping points may now be reached in a matter of years or a few decades including dramatic changes to the Indian sub-continent's monsoon, the Sahara and West Africa monsoons, and climate systems affecting a critical ecosystem like the Amazon rainforest.

Orissa: the state in discussion

While scientific predictions and government actions continue to change, vulnerability of the forest communities grow at a much faster rate. Erratic and

uncertain behaviour of rain and growing temperature are affecting the production capacity of their soil, water and forests reducing thereby their capacity to cope with changes and get exposed to more severe and newer forms of vulnerability. This paper tries to discuss some impact of climate change on the forest communities in Orissa, as a representative case. Starting with an introduction that justifies our claim that Orissa is climate's favourite play field, the discussion goes to describe some of the impacts that are going to seriously impact the forests and forest based communities of Orissa.

Orissa: Disaster Capital of India

The five-round floods that swept Orissa in 2006, swiftly albeit infamously confirmed that the state is in fact the 'Disaster Capital of India'. The total loss count worked out for these floods by the government stood approximately at 2382 crores. What is more important is that 27 out of the 30 districts were affected by these floods. A similar situation to what happened in 2001, to the surprise of people and scientists alike. The state has been declared disaster-affected for 95 years out of the last 105 years: floods have occurred for 50 years, droughts for 32, and cyclones have struck the state for 11 years. Since 1965, these calamities have not only become more frequent, they are striking areas that have never experienced such conditions before. For instance, a heat wave in 1998 killed around 2,200 people - most of the casualties were from coastal Orissa, a region known for its moderate climate. Since 1998, almost 3,000 people have died due to heatstroke. Besides the disasters that strike the state at frightening frequency, the change in the state's climate is stark. Though the debate whether Orissa is the first place to look into how climate change triggered by global warming will look like continues, there are strange changes in its climate. Stranger are the results of the change: it affects everything worth mentioning, from marriage to economy. The 1999 super cyclone, mother of all recent disasters, affected places like Bhubaneswar and Nayagarh, which were never traditionally cyclone-prone. While the 2001 drought parched fields in coastal districts, the unprecedented floods of 2001 submerged 25 of the state's 30 districts. Many of these areas had never witnessed floods before. Orissa has experienced around 952 small and big cyclones and 451 tornadoes between 1891 and 1970. From 1901 to 1981 there were 380 cyclones, of which 272 resulted from depressions in the Bay of Bengal. Twenty-nine of these cyclones were devastating. A conservative study of the effects of natural disasters reveals that between 1963 and 1999, Orissa experienced 13 major disasters, which killed 22,228 people (state government figure; non-

government figure puts the toll at around 40,000), and rendered 34,21,000 people homeless. During the Ninth Plan period (1997-2002), Orissa was in the grip of a series of disasters. On the eve of the Tenth Plan (2002-03), the entire state was going through a severe drought. The total loss of livelihood and damage to capital stock due to calamities between 1998-99 and 2001-02 stands at Rs 13,230.47 crore, according to the Tenth Plan document, Government of Orissa. This is close to 60% of the state's total plan outlay of Rs 19,000 crore for the Tenth Five-Year Plan. Natural calamities have seriously affected livelihoods in the state and the income level of households. Important fallout has been the serious setback suffered by the capital formation process in the economy. Consequently, the state's Gross Domestic Product (GDP) has been substantially depressed, says the *State Human Development Report of 2003*. The impact of disasters on Orissa's economy is evident. The state's per capita income declined fast in the second half of the 1990s, disaster-wise the worst phase. It is now half the national average. An average of 900,000 ha of agricultural production are lost every year due to disasters. Similarly, between 1980 and 2000, agriculture's contribution to the state GDP fell by 16%. Such disasters have resulted in a type of poverty known as 'conjectural poverty'. Vaidyananth Mishra, an Orissa-based economist, says: "Disasters have made Orissa the poorest state. What is more disheartening is that nobody cares to study this." The State Human Development Report, 2003 confirms it that in 30 years, the average annual loss due to disasters has gone up 27 times. While the average annual property lost and damaged during the 1970s was reported at 14.18 crore, it went up to 67.33 crore in the 1980s and a whooping 383.50 crore in the 1990s. Evidences are now enough to show that the state's ecology and weather conditions have undergone a dramatic change. Some scientists and climatologists believe that Orissa's extreme weather conditions and their frequent occurrence are a dress rehearsal for the meteorological mayhem that climate change, induced by global warming, will cause on the earth. On the other hand, the state's ecological degradation could well be facilitating the global impact. The people have been experiencing odd phenomena in the climate which they never saw in generations. They realize that Orissa's seasons have vanished from six to two and a half; trees have altered their flowering habits; animals have changed their mating season; birds have changed nesting habits; so on and so forth. Whether there is a direct link between climate change and the disasters in Orissa is still being debated and it seems it will take some time to settle, owing to the scanty amount of research being done here. Globally however it is now a widely accepted science. The severity and increasing frequency of disasters coupled with the contrasting weather

conditions arguably conform that Orissa, the disaster capital of India, is the favourite playfield ground of climate.

Orissa's forests and forest dependent communities

Last year, the Forests and Environment Minister of India revealed in the upper house of Indian Parliament that during the year 2003-05 the country had lost a total of 728 square kilometers of forests as per the estimation of Forests Survey of India. In respect to Orissa, the ministry separately said that at present it has only a meager 288 square kilometer of dense forests against a geographical area of 155707 square kilometers. Even as the Government claims the forests-land ratio to be 31 percent, many environmentalists and groups have been disputing this figure. They have estimated it to be a dismal 10 percent or less. It may be mentioned that while at the time of country's Independence, the state forests covered 48 percent of its landmass–since then, it has been regressing to a great extent causing much concern and triggering unprecedented environmental imbalances of gigantic proportions. According to norms the forests and tree covers of the state is seven percent less than the national average.

The Forest and Environment department claims that the recorded forest area in the state stands at 58136.87 Sq.Km, which accounts for 37.34% of the geographical area. The forests are concentrated mostly in central, Southern and Western parts of the State. "Forests occupy an important position in the economy of the State, particularly among rural and tribal masses. It contributes towards their food security and day-to-day livelihood", states the department further. The total forest revenue stands at 1.5% of the state revenue. The majority of this comes from Timber & Firewood, Kendu Leaf and Bamboo. Firewood, kendu leaf, bamboo and several other non timber forest produces contribute primarily to the economy of the forest dependent communities. In fact various researchers and practitioners put that at least 50% of the total rural economy in forest belts of Orissa come from the forests. It's a common knowledge that the forests in Orissa play an important role in the economy, culture and livelihood of a large number of forest dependent poor and it represents a huge economic resource for the State. It has rich potential of various NTFPs, which are important sources of livelihood for the forest dependent population. While 22% of the state belongs to the scheduled castes, 40% of its area comes under Schedule V. According to several estimates by CSO groups working on forestry issues, the tannual volume of NTFP trade was estimated at about Rs.1,000 crore in the state. The total women labour

engaged in the collection of forest produce in Orissa is as high as 300 million woman days. Any impact of climate change on Orissa's forests will erode livelihoods of these people.

Climate's Refugees : Internally Displaced People will grow in Orissa

There is growing concern worldwide over climate change pushing more and more people into the list of 'environmental refugees' by the day. The Red Cross has identified that 25 million refugees (58% of Global total) owe their displacement to climate change. Reports are coming in from all corners of the world that this figure will escalate further and by the year 2050 there will be over 200 million environmental refugees as a direct result of sea rise, soil erosion and other factors. Among other things, this will lead to new conflicts as governments and relief agencies will struggle to manage these dispossessed .

While releasing the UN's Human Development Report 2009, State information commissioner and social activist Jagadananda said, "In , a majority of the migrants belong to scheduled caste and scheduled tribe groups. Again about 2,00,000 people from the tribal-dominated areas migrate to neighbouring states to work in brick kilns and construction industries. There is huge policy gap to check migration. The government should make alternative arrangements and there is a need to identify the causes and consequences of migration." It's a well known fact that these communities and forests co-habitate. In forested areas of Orissa, forest contributes almost half to the economy of the people. In a changing climate scenario, both agriculture and forests are failing to deliver and hence migration in search of job outside is going to be the largest consequence of climate change in Orissa's forested areas.

This year, on the eve of the World Refugees Day, Antonio Guterres, the UN high commissioner for refugees, said that climate change could uproot people by provoking conflicts over increasingly scarce resources, such as water. In an interview with the Guardian, Guterres said: "Climate change is today one of the main drivers of forced displacement, both directly through impact on environment - not allowing people to live any more in the areas where they were traditionally living - and as a trigger of extreme poverty and conflict." What the UNHCR found difficult to manage was the issue of Internally Displaced Persons, according to a report that it released. Guterres said during the release, "the task is hindered by the legal distinction between refugees, who flee across

borders and automatically become the UNHCR's responsibility, and internally displaced persons (IDPs), who flee their homes but remain in their home countries. In 2007 they were estimated to be 26 million of them, and only half receive direct or indirect help from the UNHCR. "They remain under the protection of their own governments, but the governments are sometimes part of the problem rather than solution."

Many more of the forest communities of Orissa are going to be new entrants into the IDP list and hence pose a new type of challenge to the policy makers who are yet to consider climate change as the real issue and consider this in a 'resettlement' angle.

The state is on fast track to become a desert

Deforestation is one of the main causes of desertification as it enhances soil erosion, reduced percolation of water under ground as water flows down unhindered with increased velocity and hampers balances in the climate. Soil erosion due to forest degradation is serious in 52 percent of total geographic area of Orissa.

As the world observes 2006 as the year of deserts and desertification, we at the ***Water Initiatives Orissa*** warned that Orissa may well be on fast track to become a desert. Many parts of Orissa, especially the western and southern uplands, are already showing symptoms of desertification. The state is 'developing' from the drought prone to desert prone region. In just 13 years, severely degraded land in the state has increased by 136 percent, barren land has increased by 69 percent and land converted to non-agricultural uses has increased by 34 percent. In 1991-92, about 10 percent of total geographical area of the state was unfit for agriculture, forest and tree cover excluded. In 2004-05, such spread increased to nearly 17.5 percent of total area of the state. At this rate of degradation, the state is destined to turn totally barren in another 150 years or so. Agriculture lands in mining and industrial districts like Rayagada and Jharsuguda are already shrinking very fast in comparison to lands turned barren, fallow or put to non-agricultural use. In Rayagada district such unproductive lands is nearly 174 percent higher than cultivable land. In Jharsuguda, such lands amount to 65 percent of the total cultivable area of the district. Signs of land turning deserts are already visible in these and other industrial and mining districts of Orissa. Desertification will impact on the livelihood of millions of people, as dependence on agriculture in the state is

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very high. It has been estimated that 29 lakh hectares of land have already turned barren, where farming is not any more sustainable. According to the census survey of 2001, 1.7 million more people have become dependent on agriculture in 10 years. Nearly 65 percent of the State's total population entirely depends upon these shrinking and rapidly degrading lands. According to state agriculture department statistics, about 4.33 million hectares of Orissa's 6.56 million hectares of agricultural land suffer severe erosion and declining fertility. That is as high as 66 percent of total agricultural land. In a state, which has only about 56 lakh, 80 thousand hectares of sown area left, so much of land turning un-productive is a very serious thing which has been overlooked till now as the state government thinks an industrial and mining way to development. The fact that close to 90 percent of the rural people are still supported by land is looked down upon as a determinant factor in contemporary development models. The fast desertification indicates rampant environmental degradation in the state. Orissa is being increasingly considered as a culprit for global warming. The Washington based Institute of Policy Study (IPS) has estimated that by 2010, GHG emission from Orissa alone will be as high as 7 to 10 percent of the Global Green House Gas (GHG) emission. It was only 1% in 2001. Orissa is proposing many steel and coal based plants. Conservative estimates have put that if the proposed steel plants starts functioning they will alone emit 392 million tonnes of Carbon Dioxide by 2010, as they will require to burn 55 million tonnes of fossil fuel. Further, those industrial units, at the present count, will require at least 527 millions of clean water and release those as pollutants. Two of the major rivers, Mahanadi and Bramhani, are already water stressed as far as irrigation and public use is concerned. Though the Government claims to have created irrigation potential to 41 percent of cultivable lands, the fact that agriculture productions still fluctuate wildly in line with rainfall and the fact that agriculture sector growth in the state has plummeted to negatives is a matter of serious concern. These water guzzling industries will further make situation worse. Orissa's water resources is in for severe stress and degradation, the report said. Deforestation is one of the main causes of desertification as it enhances soil erosion, reduces percolation of water under ground as water flows down unhindered with increased velocity and hampers balances in the climate. Soil erosion due to forest degradation is serious in 52 percent of total geographic area of Orissa. According to the 'State of Forests Report' published by Union Environment and Forests ministry, actual forest cover has shrunk by nearly 5,000 sq kilometers although areas classified as forest land by the state

government has increased in the same period by 2,351 sq kilometers. According to scientists the desert climate is expanding its jaws in Orissa. Combination of all these factors added with the gross neglect of efforts to harvest rain water is leading Orissa on the fast track to desertification. Its time development planning is made more integrated and ecological, simply for the reason that ecology sustains majority of the people in states like Orissa.

Food security in forested areas will be dwindling

The rate at which Orissa's climate is changing is worrisome. A study by respected meteorologist Prof. U C Mohanty has revealed that rainfall days are reducing by a day in every 5 years in the state. Pattern of rainfall is adding to the pains. Information gathered from Government's rainfall records have revealed that rainfall in coastal districts of Baleshwar, Puri and Ganjam has increased, while in the Western and Southern parts of Orissa it has decreased drastically. The recent rainfall averages in Bolangir and Nuapada districts are hovering at threatening level of around 1000 mm. Information gathered from weather department indicates that while the global mean temperature rose by 0.5 degree Celsius in the last 50 years that of Orissa rose by 1 degree Celsius. Weather is becoming alarmingly extreme. In ten years, the average of the highest recorded temperatures has increased by 4.4 to 6.6 degree Celsius and the average of lowest recorded temperatures has further decreased by 3 to 5.1 degree Celsius in various parts of Orissa.

According to latest projections by IPCC, crop productivity will fall, especially in non-irrigated land, as temperatures rise for all of South Asia by as much as 1.2 degrees Celsius on average by 2040, and even greater crop loss — of over 25 per cent — as temperatures rise to up to 5.4 degrees Celsius by the end of the century. This means an even lower caloric intake for India's vast rural population, already pushed to the limit, with the possibility of starvation in many rural areas dependent on rainfall for their crops. Even those areas that rely on irrigation will find a growing crisis in adequate water availability. "Mortality due to heat-related deaths will climb, with the poor, the elderly and daily wage earners and agricultural workers suffering a rise in heat-related deaths", argue Daphne Wysham & Smitu Kothari.

Orissa is already facing the wrath of climate change, it is evident from the impacts showing up in the state. Forest drought; loss in agriculture; increasing incidences of diseases including epidemics are just a few to mention.

Coming back to the national scenario

Forests as both cause and victim of climate change

Almost 20 per cent of global greenhouse gas emissions – more than the entire world's cars, trucks, ships and planes combined – result from deforestation and degradation of forests, according to the Intergovernmental Panel on Climate Change (IPCC). Yet, deforestation continues at an "alarming" pace. Around 13 million hectares of the world's forests are being lost annually – an area of the size of Denmark, Norway and Belgium combined. Forests are not only trees. Its the biodiversity that sustains livelihood of billions world around. It is now evident that biloss and ecosystem service degradation resulting from climate change has a disproportionate impact on the poor and may increase human conflict. areas of richest biodiversity and high demand for ecosystem services are in developing countries where billions of people directly rely on them to meet their basic needs.

As in other biodiversity-based economies, in India too indigenous people will be disproportionately impacted by climate change because their livelihoods and cultural ways of life are being undermined by changes to local ecosystems. What is more important to understand is that cchange is already starting to affect the knowledge, innovations and practices of indigenous people, local communities and associated biodiversity-based livelihoods. However, it is difficult to give a precise projection of the scale of these impacts, as these will vary across different areas and different environments (Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change). Indigenous people and local communities in the Arctic depend heavily on cold-adapted ecosystems. While the number of species and net primary productivity may increase in the Arctic, these changes may cause conflicts between traditional livelihoods and agriculture and forestry. In the Amazon, changes to the water cycle may decrease access to native species and spread certain invasive fish species in rivers and lakes. In Indian forests, biodiversity plays a major role in the socio-economic and cultural lives of the communities depending on these. Many areas have already seen conflicts between different such sectors affecting thereby the forest biodiversity dependent communities significantly. To take an example, many indigenous people use wildlife, specific trees or leafs or branches or fruits, as integral parts of their cultural and religious ceremonies. Reduction in the production of these species in the

forests will increase the demand and hence conflicts. As such economic pressure on forests is already tremendous.

The Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change predicts that on the global scale, ecosystems are currently acting as a carbon sink, sequestering the equivalent of roughly 30% of anthropogenic emissions annually on average, but if no action is taken on mitigation, this sink will slowly convert to a carbon source; for this potential conversion from sink to source is linked to temperature rises due, for example, to increasing soil respiration, regional decreases in precipitation or increases in seasonality, thawing of permafrost and deterioration of peatlands, and increasing wild fire frequency and distribution. Some studies suggest that this feedback could increase CO_2 concentrations by 20 to 200 ppm, and hence increase temperatures by 0.1 to 1.5°C in 2100. The level of global warming which would be required to trigger such a feedback is uncertain, but could lie in the range of an increase in global mean surface temperature of between 2-4°C above pre-industrial levels according to some models outlined in the IPCC AR4. Deforestation and degradation will further exacerbate the process of conversion of forests from sinks to sources. This would increase the vulnerability of forest to climate change by, inter alia, reducing microclimatic buffering and rainfall generation. Forests therefore become both the contributor and victim of climate change. The above study that reports on Amazon forest can be taken as an example to show how arresting deforestation and regenerating new forests can help us in fighting climate change and save the lives and livelihood of the forest communities living on and around these resources. The report mentions that there is evidence that by limiting deforestation and degradation the Amazon would have sufficient resilience against climate change impacts into the twenty-second century. Currently, between 25-50% of rainfall is recycled from the Amazon forest, forming one of the most important regional ecosystem services. Deforestation of 35-40% of the Amazon basin, especially in eastern Amazonia, could shift the forest into a permanently drier climate, increasing the risk of fire and carbon release. This is exactly what we have observed in Orissa, which has been made a case of observation in this paper. While the Government of Orissa boasts that it maintains more than the minimum forestry cover and which is growing, the actual loss that has been felt by communities gives a contradictory picture. In this same norm the country's figures can also be analysed. The Ministry of

Environment and Forests, Government of India, claims that the country's forest cover accounts for .6% of the total geographical area of the country as of 2005. In addition, Tree Cover accounts for 2.8% of India's geographical area. It also claims that over the last two decades, progressive national forestry legislations and policies in India aimed at conservation and sustainable management of forests have reversed deforestation and have transformed India's forests into a significant net sink of CO_2. From 1995 to 2005, the carbon stocks stored in the forests and trees have increased from 6,245 million tonnes (mt) to 6,662 mt, registering an annual increment of 38 mt of carbon or 138 mt of CO_2 equivalent.

The ministry further reports that India's forests serve as a major sink of CO_2. According to its estimates annual CO_2 by India's forest and tree cover is enough to neutralize 11.25% of India's total GHG emissions (CO_2) at 1994 levels, the most recent year for which comparable data is available for developing countries based on their respective National Communications (NATCOMs) to the United Nations Framework Convention on Climate Change (UNFCCC). This is equivalent to offsetting 100% emissions from all energy in residential and transport sectors; or 40% of total emissions from the agriculture sector. So, if the GoI is to be believed, 's forest and tree cover is serving as a major mode of carbon mitigation for India and the world. However, taking into consideration the biodiversity factor and the dependence on forest biodiversity, growing incidences of drought in the forests, as we have confirmed from our field observations from Orissa – and other stress conditions make it clear that these tall claims need thorough re-assessment. And while doing it and making suitable adaptation strategies taking in consideration the communities dependent on forests are very important. Below, we briefly describe about the tribal communities or the *adivasis* of India and the impact climate change would have on those.

Adivasis and climate change

In India climate change is a massive socio-economic challenge. As has been observed climate change impact would be severe for the already poor and marginalized communities. This is due to their over-dependence on ecology for survival as well as low capacity to cope with climate change impacts like

disasters. Tribal people comprise the bulk of marginalized section in India. And with a total population of more than 80 millions – more than the total population of major European countries like United Kingdom, France or Germany - they are no less in number. (See table: *Tribal Trail – Pathetic indicators*).

India, the second fastest growing economy in the world, is dependent on ecology of which 60 percent of its population depends on agriculture for survival. So climate change will directly impact the majority of the population. India scores a lowly 128th rank in Human Development Index (HDI) out of 177 countries with world's maximum poor. About 296 million - about 26 percent of total Indian population live under £ 0.16 a day – the Poverty Line adopted in India. This is about 11 percent more than the combined total population of Europe and Australia continents. Income and resource distribution is unequal to the brim. These people mostly stay in 0.64 million rural villages across India, about one-third of which located in or near forests – about 1/5th of those villages are inhabited by tribal, termed in India as Scheduled Tribes.

Tribal population live in geographically and climatologically most hostile locations and depend on most vulnerable livelihoods like agriculture. These areas are the most underdeveloped and poorest regions of India. (See table: *Children of rugged terrains*).

A tribal's economy is ecological. This is the single most important reason for their vulnerability to climate change. The resources that they depend upon have already shown very high susceptibility to climate change. That's why they bear the most of climate change impacts. Tribal people are facing hell of hardships as nature and extent of forest, water, agriculture and other such natural resource based traditional livelihoods are succumbing to climate change led degradation or other anthropogenic interference.

Table: Tribal Trail – Pathetic indicators (in %)

Category	National	Tribal
Population Living below £ 0.16 a day	26	47.2
Literacy Rate	64.8	47
Dropout rate at Secondary level	62	79

Table: Children of rugged terrains

State(s)	Tribal Population	Feature
Madhya Pradesh	60 million	The state with highest forest cover in India.
Orissa	4.1 million	Poorest state of India where two -thirds of the total tribal population live on less than £0.16 a day.
Nagaland, Meghalaya and Mizoram	85% of total population	North-Indian Himalayan states. Heavily dependent on forest.
Rajasthan	3.5 million	Desert state.
Lakshadweep	95% of total population	Highly vulnerable Island state

The adivasis are already suffering due to deforestation caused by the modern development processes carried forward thindustries, mining, dams and other such mega projects. Climate change will further displace these people from their forests. Various reports confirm that in the development drive post-independence, the *tribal population has been disproportionately affected. While an estimated two per cent of the total Indian population has been displaced by development projects, 40 percent of these are tribals although they constitute only 8 percent of the total population (Courtland Robinson, May 2003).* There are no official statistics on the numbers of people displaced by large projects since independence. In 1994, the Government mentioned the figures of 15.5 million internally displaced and acknowledged that some 11.5 million were still awaiting rehabilitation. However, calculations based on the number of dams constructed since independence indicate that as many as 21 to 33 million persons are likely to have been displaced (Fernandes 2000). However, these estimates do not include persons displaced by canals, or by the construction of colonies or other infrastructure. Neither do they include those who have been subjected to multiple displacements (Rangachari, 2000). According to Human Rights Watch, Indigenous peoples, known as Scheduled Tribes or Adivasis, suffer from high rates of displacement. They make up 8 percent of the total population but constitute 55 percent of displaced people. This has had a serious effect on the overall development of these communities. The resettlement and rehabilitation of the large number of persons displaced by development projects has been far from successful. With climate change these people will be further vulnerable and rehabilitating 'climate's refugees' will be a

daunting task for the Government of India. So, more and more tribals are going to enter into the list of Internally Displaced People (IDP). As already discussed earlier, UNHCR estimates say that in 2007 at least 26 million people got forcefully displaced due to climate change and got added to the IDPs.

Climate change and health

For people who flee the forests the challenge is enormous. For people who still live in the forests, climate change is having other devastating impacts than just crop loss or food insecurity. Health of the forest communities will be at a vulnerable state owing to climate change.

While climate change will have several impacts on human health, the tribals living in and around forests will have to bear new and newer forms of diseases that will impact their productivity to an unrecoverable extent in many cases. There are still not many studies available on the impacts of climate change in the forest areas. However, taking the example of Malaria, which is already a menace in the forested areas, would show how vulnerable would the tribal communities become.

It is already evident that changes in climate may alter the distribution of important vector species (for example, mosquitoes) and may increase the spread of disease to new areas. Malaria is one of the important climate-change related diseases that has been extensively studied since 1960s. India's initial NATCOM project chose malaria for an in-depth study to develop the relationship between climate parameters and disease incidence, and for studying its future spread in the climate change context. This report indicates that high altitude populations that fall outside areas of stable endemic malaria transmission may be particularly vulnerable to increase in malaria, due to climate warming. The transmission windows of malaria in different states of India in 2000 and 2080 indicate that malaria may penetrate elevations above 1800 meters and some coastal areas. 10% more states may offer climatic opportunities for malaria vector breeding throughout the year with respect to the year 2000. It has been reported that climatic changes will result in increased incidence of other vector borne diseases like dengue as well as water-bornediseases like diarrhea also. In a recent public hearing on climate change, a deponent from the Similipal forests of Orissa claimed that malaria and other unknown diseases has increased manifold in the last 15 to 20 years. There are many such observations from other forested areas of the country as well which

hints at increasing disease episodes in forested areas as well as spread of these to other areas.

Mitigation through bio-fuels may marginalise the tribal communities further

India's National Action Plan on Climate Change informs that India has in place a detailed policy, regulatory, and legislative structure that relates strongly to GHG mitigation: The Integrated Energy Policy was adopted in 2006. One of its key provisions is "emphasis on renewable including biofuels plantation". Biofuel, as experts believe, has many attributes. It is fully renewable if produced in a sustainable manner, grows in any soil and climatic condition, contribute in reduction of green house gases (GHG) and helps in arresting environmental pollution. Experts also believe that biofuels are non toxic and biodegradable. The Biofuel Development Report 2003 of the Government of India mentions that among all the biofuel crops available, Jatropha is the most accepted species because of its several positive points over other oil seeds bearing species. Apart from contributing to the energy security of our country, it helps in greening the wastelands and preventing droughts, generates jobs in the economically backward areas. In addition to that, oil content in jatropha seeds is highest amongst other non edible oilseeds bearing plants, asserts the report. Government of India has planned for the potential plantation of Jatropha species in almost all the states and identified the wastelands available throughout the country (both forested and non-forested areas).

What concerns in the above is that in many forest and rural areas, where jathropha has already been planted, tribal people have found themselves at the suffering end. As envisaged in the National Action Plan, market based solutions are being sought in promoting biofuels and this is promoting private sectors in jatropha which means they would be more concerned with their profits and not on anything else. In Orissa's Bolangir district we have investigated how a bio-diesel company frauded with poor illterate tribals and took away their land in the name of jatropa plantation. This is happening everywhere in the country. We are not going into further details on this at the moment. However, it would be worth mentioning the latest warning by the UN on biofuels, which talks about other hazards of rampant promotion of biofuels. Titled "Sustainable Bioenergy: A Framework for Decision Makers," also warns that an unregulated biofuel boom will spawn deforestation, deplete soil nutrients, and undermine food security by monopolizing farmland. "The rapid growth in first-generation liquid biofuel production will raise agricultural

commodity prices and could have negative economic and social effects, particularly on the poor who spend a large share of income on food," the report says[7]. In many parts of the world, such as Southeast Asia, biofuel businesses have already cleared primary forests to plant energy crops such as palm. After fossil fuel use, deforestation is the largest single source of greenhouse gas emissions into the atmosphere, climate experts point out. The government of India as well as other stakeholders need to be very cautious in promoting bio-fuels or else more tribals will face displacement and economic doom due to this.

The REDD Initiative : Less mitigation more business

The recently concluded UN climate talks in Bangkok, which rather ended inconclusively, had an intensive discussion on the Reduced Emissions from Deforestation and Degradation (REDD). In line with the controversies that have been emerging in the climate change negotiations of the world since 1997, this initiative has also been dragged into controversy. NGOs like the Global Canopy Programme, who are strongly propagating the REDD initiative; argue that this initiative has the potential to mitigate as much as one-fifth of global warming. This promises to be a huge opportunity keeping in mind the argument of these same groups who put the total green house gas emissions from deforestation at 16%. Around one-fifth of the world's poorest people depend on forests for their survival; forests are also home to 90% of the world's terrestrial biodiversity. REDD seeks to redress this problem by first measuring the extent of deforestation and degradation, and what can be done to enhance this potential. REDD initiative has a funding mechanism. Partly, these are voluntary transfers from industrial to developing countries where forests have to be preserved. There are also market instruments like carbon credits. These funds will go towards an additional mechanism to deal with deforestation as well as a redistribution mechanism. In the Bangkok rounds, countries also discussed a forest reserve fund for conservation.

REDD is however opposed by several groups like the Greenpeace. These groups have criticized the European Union for its efforts to include REDD as part of climate negotiations. Particularly problematic is the EU's position of including Sustainable Forestry Management (SFM)) within the scope of REDD. These groups argue that, over the past two decades, this term has been co-opted by the forest industry to lend a green image to some of the most destructive logging practices in the tropics.

Looking into the experience of other such mitigation measures where the industries and markets have been given a free hand in earning carbon credit through fraudulent and manipulated ways of using these mechanisms, civil societies have coined interesting terms for REDD. One of the interesting expansions for REDD by the CSOs is R = 'Reaping Profits', E = 'Evictions and Land Grab', D = 'Deforestation', and D = 'Destruction of Biodiversity'. In a document released in Bangkok titled 'Why logging will not save the climate', Greenpeace has especially criticised the switch in terminology from "sustainable management of forests" to "sustainable forest management" in the negotiations. Such changes in terminologies could actually mean a lot in the negotiations that impacts lives and livelihood of the poor people. Governments may fix targets for earning money through REDD but the sufferers will always be the poor; the adivasis and other communities living in and depending on forests. Nur Masripatin, who led Indonesia's delegation to the Bangkok talks, was reported as saying "In 2005 alone, Indonesia's government has opened 2 million hectares of virgin forests in the Kalimantan for palm plantation, and it will raise revenues of more than $567 million and employ 500,000 workers within five years." A journalist quoted Nur further saying, "We have to remember, always, that REDD is designed to help developing countries decrease their emissions from deforestation and degradation without sacrificing their national development."

The Government of India is trying to show that its seriously thinking of mitigating climate change impacts and has also been pressing for the inclusion of degraded lands in REDD, to qualify for such funding. It is however apprehended by many CSOs that this will further open up the lands of the tribals and other forestlands to industrial plantations and genetically modified plants.

REDD as an initiative therefore is beset with several controversies and is surely to get opposed by indigenous communities who may lose out on their livelihood owing to climate change as well as such of its mitigation measures. While the GoI, which is trying to play a major role for developing countries in climate talks, is all out to welcome REDD; it has conveniently forgotten any discussion with the forest and forest dependent communities of the country. India talks of "REDD Plus" that indicates its concerns for inclusion and development of the communities depending on forests, the fact that there has not been any move so far to consult the communities raises doubts about the real intent of these 'words'. In a recent report released in August, in its build up

for the Bangkok talks, Environment minister Jairam Ramesh writes, "have taken a number of recent initiatives in this direction, including the launch of a landmark fund for the regeneration and sustainable management of our forests with an initial corpus of US$ 2.5b, as well as an annual budget of about US$ 1b." While this may be looked into as an effort of the Indian government to woe further funds under the REDD mechanisms, the following words confirm that the government is seriously pushing for REDD initiatives. "It is India's view that we need an agreement on a comprehensive framework for compensation and positive incentives for forestry as part of the ongoing climate change negotiations. It is important that any such agreement provides incentives not only for Reducing Emissions from Deforestation and Forest Degradation (REDD), but also for Sustainable Management of Forests (SMF) and Afforestation and Reforestation (A&R). A "REDD Plus" approach that includes SMF and A&R is required in order to fulfill the principles of equity and efficiency. India has put forward a formal submission on a potential conceptual framework for such an agreement as part of the UNFCCC process, which I believe sets up a sound foundation for discussion towards an agreement", wrote Jairam Ramesh in that report.

The fact remains that the forest communities have neither participated in the formulations of these policy documents, nor will have a role in implementing them. It is for sure that REDD will remain a controversial initiative and is most unlikely to benefit the forest communities of India. It will be more business then mitigation.

Some issues in Sustainability

- Experts increasingly agree that active protection of tropical forests is a cost-effective means of cutting global emissions. An international mechanism of reducing emissions from deforestation and forest degradation (REDD) is likely to emerge as a central component of a new agreement in Copenhagen. However, many issues need to be resolved, such as how to verify the reductions and ensuring fair treatment of local and indigenous forest communities.
- A number of innovative approaches are emerging to keep carbon out of the atmosphere, including the use of "biochar", biologically-derived charcoal. It is mixed in soils, increasing fertility and potentially locking up carbon for centuries. This is a 21st century application of a technology known as Terra Preta, or Black Earth, used by Amazon

- peoples before the arrival of Europeans in South America.
- The reality of a rapidly-changing climate may make conventional approaches to conservation and restoration of habitats ineffective. Drastic measures such as large-scale translocation or assisted colonization of species may need to be considered.
- Eco-agriculture, in which landscapes are managed to sustain a range of ecosystem services, including food production, may need to replace the current segregation of land use between conservation and production. This could help create resilient agricultural ecosystems better able to adapt to the changing climate conditions.

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6. Climate Change, Health and Sustainable Communities

Dr. Mira Shiva M.D.

The impact of climate change on public health has been evident over the past few decades, even though the magnitude and intensity of the impact has not been systematically monitored and documented.

An effective disease surveillance system would have shown the changing disease pattern. Many of the diseases have their roots in multiple causes: collapsed public health system, deteriorating nutrition because of spiraling food prices etc. and environmental degradation and global warming.

There is little understanding of the concept of relationships of biosphere and human health, of ecosystems, ecology and human health with no understanding of this, or denial of this. Projects, policies and paradigms that have been extremely destructive have been relentlessly pursued, in the name of economic growth, often corporate led, supported, promoted by International Financial Institutions. The possibility of the financial crisis was never imagined by those who were involved in its creation nor is the ecological crisis, its magnitude, admitted by those responsible for creating it. As in the case of financial crisis the climate change adverse effects will be faced most severely by the poor in the developing countries.

Human, animal and plant life and sustained population health require the life supporting "services" of the biosphere.

Dr. Mira Shiva M.D., Cordinator, Initiative for Health Equity & Society/TWN Diverse Women for

World Health Report 2002 estimated that 2.4% of world wide diarrhoea and 6% of malaria in 2000 was because of climate change. By now it would probably be worse because of extremes such as drought and flooding. Monsoon failure has aggregated the water crisis. In Uttarakhand, 70% of the water resources (springs & stream) have been lost in the past decade (Navdanya, Participatory Research on Climate Change in the Himalaya 2009.) India has seen extremes of climate from heat waves to cold waves.

There is an increase in the epidemiologically well acknowledged seasonality of diseases, summer monsoon related diseases, water borne and food borne diseases eg. Salmonellosis (Typhoid, Para Typhoid), Hepatitis and vector borne diseases, Malaria, Japanese Encephalitis and new ones eg. Chikungunya. There is a known increase in the magnitude and severity of acute Respiratory Infections, Pneumonia in the elderly, children, worsening of viral fever, bronchitis, asthma attacks, chronic obstructive lung disease (COLD) in elderly and women, who cook using smoke producing fuel,. Unseasonal rains and climate change do not only destroy crops but are resulting in seasonal viral fever.

The impacts of climate change will fall disproportionally upon developing countries and the poor persons within all countries thereby exacerbating inequities in health status and access to adequate food, clean water and other resources, IPCC 2001.

Climate Change and "Natural Disasters"

Climate change provokes more grinding poverty and mass migrations. Climate change refugees, are forced to leave hearth and home lands, seeking means of survival elsewhere, may face human rights abuses, violence and sexual exploitation of young women, growing regionalism, caste, and religious divide and violence. It is estimated that from the current figure of 25 million the number of environmental refugees will increase to 150 million by 2050. This has serious public health implications.

2009 saw unprecedented floods in North Karnataka and Andhra Pradesh, areas acknowledged as drought prone. Unprecedented delayed rains, overflowing dams, and release of large amounts of water resulted in downstream flooding. Whether it is flood or drought relief, it is never adequate and equitable.

Overcrowded unsanitary refugee camps would be unable to cater to the increasing needs of food and water, shelter and sanitation, of more and more climate change refugees to basic needs of food and water. Increased emergencies will arise due to floods, cyclones, drought affecting the vulnerable people from the vulnerable areas, requiring humanitarian relief, rehabilitation as well as medical and health care. Responses would be inadequate as world recession and aid fatigue sets in.

The economic and societal costs of these impacts are estimated to be huge (Parry et al 2001). An increase of temperature of 2°c by 2050 could result in

- 228 million more people at risk from malaria
- 2240 million at risk from water shortages specially in subtropic
- 20 million more at risk of flooding
- 12 million more at risk of hunger as crop yields fall

The hunger estimates have not taken into account the existing food crisis and food shortages which will worsen the food situation and lead to increased starvation, malnutrition and vulnerability to infection.

Extreme Heat

Death from heat stroke with the heat waves is well known. Many more are afflicted with heat exhaustion and heat strokes that require hospitalization, with inability to work and loss of earning and productivity. It is the poor, elderly and those engaged in hard work in high temperatures, without shade, adequate water for rehydration who are the most vulnerable.

Intense heat resulting in hyperthermia impacts human life by increasing mortality from heart and respiratory diseases. Natural disasters cause not merely physical damage, loss of life, homes, livelihoods, household animals, precious belongings having deep sentimental, psychological and religious significance, but also cause Post Traumatic Stress Syndromes (PTSS) and psychological wounds which never really heal, because of loss of loved ones and forced migration.

In 1994 in western India temperature went up >50° C. Post super cyclone in Orissa in 1999, parts of Orissa saw unprecedented temperature rise, which left

over 2000 people dead. In 2003 Andhra Pradesh saw 1421 people killed by the heat wave.

Trees provided shade and we now realize trees also act as Carbon absorbing sinks. Loss of trees, non access to safe adequate drinking water worsens the sense of heat. Loss of traditional knowledge about how to protect oneself from heat wave, the making and taking of 'system cooling' drinks, eg Panna, Thandai, Sattu, have made matters worse. Aggressive marketing of demineralizing, gastritis producing, fizz drinks, with non availability of the "free" drinking water for travelers, will see the traditional wisdom of protecting oneself from heat slowly edged out and disappear. The role of Traditional Wisdom in dealing with heat stroke and preventing deaths from heat are seen in Rajasthan even as temperature soar to 50 degree C in summer has been tremendous. Measures to beat the heat are several, adequate and appropriate hydration, covering head and body, avoiding the hottest hours by rescheduling travel, the wearing of non synthetic clothes. The need for eco friendly construction, architecture cooling environment would need to be revitalized and encouraged, as also the energy conserving options of lighting of CFL bulbs and use of public transport.

Heavy Rains

Mumbai Rain – On July 26 and 27, 2005 over 1000 people were killed following unprecedented rain downpour. This was the highest ever rainfall received at a place on a single day in the whole century: 944 mms according to the meteorological department which is even more than the rainfall in Cherapunjee, once considered the wettest place but slowly drying now. Property worth Rs. 170 billion was destroyed.

In 2006 rains in Rajasthan saw floods in the otherwise desert areas of Barmer in Rajasthan; There were floods in Surat, Ahmedabad, and Baroda in Gujarat also. Floods were also reported in Bangalore and Calcutta.The floods resulted in several deaths followed by waterborne diseases, the worsening of the nutritional status of the children.

Certain diseases are associated with floods eg. rodent borne diseases like plague (Yersenia Pestsis) leptospirosis, hantavirus, tick borne encephalitis. Both drought and floods increase risk of diarrhoeal diseases, the major ones being cholera, typhoid, para typhoid, hepatitis A & E, giardia, amoebiases, Shigellosis (Bacillary dysentery).

The plague outbreak in Surat, Gujarat, in 1994 followed the flooding of the river, with rodents and garbage, entering shanty houses along the bank.

Water Shortages

Poor rainfall, resulting in failure to recharge water sources, would further result in worsening of the water shortages. Water security is already a major problem affecting four out of ten people. Water shortage would worsen thirst, dehydration, with inability to address heat stroke and also contribute to worsening of health, hygiene and sanitation. Contaminated water would increase the number of deaths from water borne diseases of which already kill over 1.8 million people die annually, globally, the majority being little children.

It would also increase certain vector borne diseases. In absence of regular supply of water, water is stored for long periods, not merely increasing the possibility of contamination and spread of water borne diseases, helminthiasis, but also becoming a breeding ground for mosquitoes spreading dengue, malaria and filaria. The Falciparum malaria outbreak in Rajasthan in 1995 which killed around 4000 according to Civil Society estimates, and hundreds according to the Government was caused by breeding of anopheles Stephensi in the drinking water storage pots.

Water scarcity is linked with inability to maintain body hygiene, resulting in skin diseases eg. fungal infection, scabies, impetigo boils, body lice. This is worsened when there is heat and humidity. Feeling hot and sticky, without adequate water to bathe besides physical discomfort, has psychological impact giving sense of uncleanliness, causing depression, irritability and anxiety.

Drought

India has known drought and famines earlier, but they are becoming more severe chronic and in many more areas.

Drought in Orissa, between 2000 – 2002, affected 11 million people.

Bundelkhand has had no rains for 4-5 consecutive years and there has been migration of people leaving elderly behind. Vidharbha which is tragically known for the highest number of farmers suicides has been facing drought.

The above states have faced drought in the past decade. This year over 278 districts have been acknowledged as drought affected.

Public Health Impact of Shrinking Water Resources

Water shortages make matters worse, as drinking water for adequate hydration is not available, nor for bathing, which in summer months becomes all the more important for hygiene, washing off the sweat, as well as keeping the body temperature cool, especially in the absence of cooling facilities like fans.

As water resources shrink, water levels in wells fall, rivers become dry. In metropolitan areas, the worst hit by water shortages are women and the people living in Jhuggi Jhompries, the so called illegal colonies along nalahs and railway tracks – areas where the economic and environmental refugees move for work and survival, places which are excluded from provision of civic amenities such as water and sanitation.

Vector Borne Diseases

Climate change and global warming are associated with increase in pests, insects and their movement to new areas in search of food. There is an increase in their number, and emergence of resistance to the control measures used involving pharmaceuticals, pesticides in higher doses of more "potent" toxic chemicals. The increasing use of chemicals in turn results in increasing health hazards, increase in cancer, spontaneous abortions, congenital malformation, liver and kidney failure. As higher concentrations of these chemicals takes place in the water sources and in the food chain irreversible health damage takes place, afflicting future generations. Many such technological fixes have a much higher physical, social and ecological cost than is recognized.

Malaria

Spread of Malaria is climate related and worsening of the situation is expected. Malaria continues to kill a large number of our people, especially in the endemic areas eg. Orissa, Chattisgarh, Jharkhand, Assam Bihar, etc. Highly vulnerable are the already anaemic women and children in tribal areas.

1994 saw unprecedented early and good rains in Rajasthan, creating mosquitogenic conditions, beyond the water logged area around the Indira Gandhi canal. With public health services unable to reach the people in far

flung areas in the districts of Bikaner, Jodhpur, Jaislmer, Barmer and with the local people unfamiliar with the malaria disease and with no warning about the strain being the more deadly Falciparum malaria (PF) (with much higher mortality rate than Plasmodium Vivax (PV), with health facilities public or private being at a great distance from the dhanis (homesteads), there was precious time lost in curtailing the outbreak and in saving lives. Civil Society estimates that there were over 4000 deaths even though this was denied and a gross underestimated number of deaths was officially admitted.

With further climate change, global warming is accompanied by untimely rains, migration of inadequately or untreated infected workers from malaria endemic areas, increasing urban construction sites, inadequate disease surveillance and collapsed public health system, especially in tribal areas. Falciparum malaria is not merely bound to spread, but that too with drug resistant strains. Falciparum malaria in pregnant women is associated with worsening of anemia, spontaneous abortion, still births, low birth weight babies, hypoglycemia and higher maternal mortality. High maternal mortality in Orissa, Chattisgarh, Jharkhand, Assam, Madhya Pradesh is definitely related to the high incidence of malaria.

In areas where earlier 20-30% of malaria was Falciparum, today it is 80-90%. Not merely that, but chloroquin and other anti malarial drug resistance has increased in the parasite, and so has the resistance of the mosquito vector to the insecticides used. Health hazards of the insecticides are well known, as many are used extensively in agriculture. With increase in malaria due to global warming not merely lives are being and will be lost, but work productivity will be undermined.

Dengue

1996 saw Dengue spread by Aedes Egypti mosquitos with its more life threatening version i.e. Dengue Hemorrhagic Fever (D.H.F), Dengue Shock Syndrome (DSS). Over 400 deaths took place in Delhi. The vector being Aedes Aegypti, which is a day biter and "close to home" breeder, i.e. in vases, water coolers, and water tanks.

While the focus was on Dengue in Delhi, unprecedented early and heavy rains had left large tracts of fields inundated in the Mewat region in Haryana. The majority of the dead were poor, mainly women and children.

The Dengue outbreak in 1996 was followed by many unknown viral fevers, associated with deaths of children. This highlighted the fact that we were dealing with vector borne diseases, with which the medical community was not familiar, and therefore unable to diagnose and treat. In absence of proper diagnosis, proper treatment is not given and the existence of the problem denied or the extent of the problem grossly underestimated. Added to the absence of diagnostic facilities in public health systems, and therefore early and accurate diagnosis of these emerging new and old diseases is the disinclination of private medical practitioners to report, deaths of the untreated or those at home are not taken note of. Many of these diseases are notifiable diseases. This adds to the underestimation and therefore inadequate response. In absence of proper public health measures to address vector borne diseases, morbidity and mortality will further increase. This would be worsened by climate change linked rise in vector borne diseases old and new. Even at present a large number of cases of Dengue are being reported in Delhi and Indore, including fatalities.

There is a need for preventive measures, early diagnosis & effective management including recognition of complications such as bleeding due to low platelet count, requiring blood or platelet transfusion, which would mean access to blood, blood banks with Blood Separators, blood donors & blood testing facilities to exclude blood infected with HIV, Hepatitis B & C, syphilis, malaria etc.

Japanese Encephalitis

Japanese Encephalitis is a vector borne disease. Ducks, pigs etc. are the hosts. A decade ago rains in Patna causing floods, resulted in deaths of several children from fever. They were diagnosed as Japanese Encephalitis, most afflicted were children less than 10 years age from the city slums.

Over 2000 deaths from Japanese Encephalitis (JE) were reported from Gorakhpur and districts around. The infecting organism was arbovirus .

Deaths of over 1000 children in Saharanpur from mysterious disease were noted, few years ago. These were diagnosed as 'JElike' but not 'J.E.' It was one of the new viral fevers, Hantavirus.

The fear of Severe Acute Respiratory Syndrome (SARS) and later Avian Flu, led to culling of millions of chicken. Many of these being domestic backyard chicken and not commercially bred industrial poultry. Family incomes as well as family nutrition of the already poor further dwindled, in West Bengal, Assam and Orissa because of this.

Chikungunya

Chikungunya, is spread through the Aedes Aegypti mosquito. It results in a viral fever meaning 'bend over' in Swahili, in Africa. This was totally alien to the Asian region. Following its introduction only in this decade it rapidly spread across the country affecting thousands of people especially the elderly; it is incapacitating and debilitating, and associated with relapses. There have been little or no diagnostic facilities for viral infections except for diagnosis based on clinical presentation and not very effective management guidelines. Even as deaths took place in Kerala and Ahmedabad, Chikungunya as the cause of death was denied.

As the number of new viral diseases afflicting our people increases, when serological testing for confirming diagnosis is not easily available or is costly and time consuming, then large number of these infections remain undiagnosed and untreated. At present blood samples have to be sent to NICD (National Institute of Communicable Diseases, Delhi) or NIV (National Institute of Virology, Pune).

The newer viral infections take on more severe virulent forms and are associated with higher mortality, where even the nature of the complications is not widely known by the health treating personnel eg. Viral fever associated with breathlessness because of myocarditis is a complication that is claiming many lives.

As the virus mutates taking on more virulent forms, and as travel and trade facilitate the spread, it is difficult to imagine how any major severe outbreak will be addressed.

According to WHO over 250,000 to half a million deaths take place worldwide each year due to flu (Influenza A & B). It may be important to remember that Tamiflu, which is stated to deal with Avian flu strain H5N1 has been stock piled by the richer nations and may not be available to poorer developing countries

since the high price makes it out of reach of those most vulnerable and in greater need. High costs due to patent holders price privilege would make purchase by any Government, in case of outbreak affecting large populations.

Zoonotic Diseases

Climate Change is associated with increase in Zoonotic Diseases.

Plague

Causative Agent is a Yersenia Pestis gram negative Cocco bacillus spread by the rat flea.

Virulence depends on endotoxin produced by the infecting organism.

Yersenia Pestis can survive and multiply in rodents and humans. Medicine used for prevention as well as treatment is the easily availabile and affordable Tetracycline.

It may be recalled that during the 1994 plague outbreak caused by flooding of the river with floating garbage, infected rats entered many homes with infected fleas, and thus infecting humans. Concerns about atypical epidemiology and microscopic structure of the plague did raise concern in Surat, people panicked and fled. Even the private doctors fled. People from Surat landing up in other states were beaten up. Historical terror of plague "Black Death" continues to exist.

Leptospirosis, Spirochetes

Leptospirosis is essentially an animal infection, transmitted by spirochetes to humans under certain, environmental conditions through infected urine and faeces of rodents. Spirochetes can survive for weeks in soil and water.

A Leptospirosis outbreak look place in Orissa after the super cyclone on 29th October 1999. Later, in August 2000, cases of leptospirosis were reported in Gujarat, Kerala, Maharashtra and Andaman and Nicobar. Ref: WHO (2000) Weekly Epidemiological Record No.27, 7th July 2000.

Increase in Zoonotic diseases due to climate change is expected to occur. Medical institutions are unable to diagnose and also unable to report to notify

them in absence of awareness, facilities and also because as these are not notifiable diseases. Many of the viral diseases affect the brain specially of children and are associated with high mortality and irreversible brain damage converting the victim to a vegetable for the rest of their life.

Trade Related Intellectual Property Rights (TRIPS, TRIPS PLUS) – Diagnostics, Medicines, Vaccines, Climate Change Technologies

There are serious Intellectual Property Rights concerns, as the virus cultures have been shared and donated by WHO member countries, free of cost to WHO collaborating centres, which have passed them on to private research labs which are claiming patents. An attempt to patent SARS virus was made and stalled following protests. This raises serious public health concerns regarding sharing of benefits, about the need to look for alternatives to ensure that public health concerns take priority over trade. The recommendations of the WHO "Commission on Intellectual Property Rights (IPR), Innovation and Public Health, (CIPH)" and their implementation become so important. The patentability criteria are crucial, as with patenting of a gene, gene sequence, there would be monopoly control on diagnostic tools and any associated vaccines would occur. Many public health and civil society groups have urged that there should be "no patent on Life". The IPR issue would also affect access to climate change technologies.

Under such circumstances every tool available for decreasing the negative impact as well as dealing with the consequences of climate change must be protected, in the public interest. The closure of the three public sector vaccine plants is of significance. The cost involved in ensuring maintenance of the infrastructure and trained personnel required, for quality products, from public sector would be far less than the cost of vaccine imports and future dependence on private corporations committed to profit maximization.

Monopoly control of diagnostic kits and anti virals, anti bacterials because of Intellectual Property Rights on genes or gene sequence required in such outbreaks and epidemic in such a situation becomes major public health concern.

The IPR concerns exist also where seeds are concerned; biopiracy of the traditional flood resistant, drought resistant seeds by corporate giants in the

name of Climate Change technologies needs to be tackled. IPR issues related to Climate Change technology needs to be addressed.

Climate Change and Food Insecurity

Malnutrition and Hunger

The effect of climate change and global warming on food production is well recognized, as floods, drought, falling water levels, drying up of rivers, rising sea levels, and cyclones in coastal regions would negatively affect agriculture. The ongoing drought in Bundelkhand for four years, and earlier in Saurashtra, Gujarat, Chattisgarh, etc. affected not just the crops, but the entire lives and livelihood of thousands of people as crops die, as household milk animals die due to lack of fodder.

Thousands have had to migrate, adding to the seasonal migrant workers, from Bihar, UP and Chattisgarh, leaving behind the women who are called "grass widows" exploited in many ways and the elderly who are neglected and lonely, or moving in a large mass, worsening the vulnerability of women and children, most of whom are already malnourished and anaemic.

The present drought in Australia has significance for India. It is a reminder that food security based on food imports cannot be depended on. The large scale shift to non food crops, eg. biofuels, and taking large tracts of fertile land for SEZ's (Special Economic Zones) for industrial purpose will jeopardize food security. Energy intensive agriculture based on pesticide and fertilisers will be contributing to global warming, depleting water and other resources, and their chemical pollution and poisoning will have severe health impact for present and future generations.

In a country with such high levels of malnutrition, hunger and starvation deaths, jeopardizing food security, food availability and food affordability would be catastrophic and result not just in higher infant mortality, maternal mortality, deaths from infectious diseases, but create social, unrest, besides mass migration to urban areas.

Food production now 230 million tones might fall 20-40% by the end of the century.

Malnutrition and Food Shortage

With climate change induced decline in cultivatable land, worsened by non food production thrust, and other industrial activities resulting in diversion and the shortage of water, this would cause further food shortage thus worsening the nutritional status of the already vulnerable. The per capita pulse consumption has declined since the 1950's. National Family Health Survey – 3 (NFHS 3) has shown worsening of childhood anemia which affects 79.1%. There is significant wasting and stunting of the children, 1/3 newborn babies being Low Birth Weight (LBW) babies, 36% of women have a very low Body Mass Index < 18.5, indicating an inter-generational nutrition gap due to poor nutritional status of mothers. Climate change will only make it worse for the mothers and the children.

Fortified processed food imports by corporations is not the answer. Adequate, safe, nutritious food, encouraging local food production that protects livelihoods of millions is needed. Climate Change is eroding those options, as it comes along with many other survival threats.

"If humans pursue a business as usual course for the first half of the century, I believe that collapse of civilization due to climate change becomes inevitable." (Flannery 2005, pg. 209)

Energy use, Climate Change and Health Impact

Fossil fuel burning appears to be the underlying cause of global warming as about **6 billion tons** of carbon are released into the air annually.

Transport – Climate Change and Health

Transport and travel are major drivers of climate change. Transport has led to increase in its share of green house gas emissions from 19% in 1971 to 23% in 1997 (IEA 1999C IPCC (International Panel on Climate Change) 2001b). In 2000 it was 25% higher than 1990 and is expected to grow by nearly 90% between 2000 and 2030.

Road crashes and accidents kill 1.2 million globally and injure another 50 million. By 2020 road accidents may be 3rd largest cause of disability adjusted life years lost (Murray 1996).

Growth of super fast highways and fast cars are meant for western roads and not for a densely populated country like ours, with people from different economic backgrounds, with different modes of transport and travel. Aggressive marketing of auto mobiles while neglecting public transport will add to our pollution, accidents, road rage and chaos, hypertension and stress. The number of motor vehicles is expected to increase by 62% between 2003-2012.

Respiratory Illness

Dust storms, rain, cold, affect respiratory system. Presence of infections viral common cold, influenza in already malnourished, immunologically compromised results in increased vulnerability to secondary bacterial infection.

Acute Respiratory Infection is amongst the top killers of children along with diarrhea. Large numbers of the elderly already suffer from chronic obstructive pulmonary disease, with asthma, chronic bronchitis etc.

Fires and smoke affect many, not just of the place but also neighbouring areas. Forests Fires in Indonesia in late 1997 left large and increased respiratory illness over southern south East Asia. Recent fires in Australia have not been seen in 70 years.

There have been fires in India destroying Jhuggi colonies in Delhi, Mumbai, markets in Calcutta. Forests in Uttaranchal and Himachal Pradesh have suffered from forest fires destroying the undergrowth, (destroying medicinal and other plants), and further increasing temperature and decreasing the CO_2 absorbing forests – the important carbon sink. Increase in temperatures affect levels and about 300 million people suffer from asthma. In 2005, 255,000 deaths took place. Asthma deaths are expected to increase by almost 90% in next 10 years.

Recommendations

The inexorable links between people and their environment constitutes the basis for a socio-ecological approach to health. The conservation of natural resources throughout the world should be emphasized as a global responsibility. The protection of the natural and the built environments and the conservation of natural resources must be addressed by many as health promotion strategy.

"Health promotion is the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realize aspirations to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy life-styles to well-being.

The fundamental conditions and resources for health are: peace, shelter, education, food, income, a stable eco-system, sustainable resources, social justice, and equity. Improvement in health requires a secure foundation in these basic prerequisites.

Raising Public Awareness and that of policy makers about the need to ensure public health security by acting on climate change. This is a priority at the national and international level.

Ensure that Technology and Finance for Climate Change mitigation efforts are made available and there are no IPRs linked with Climate Change Technologies preventing their use of technologies by developing countries.

Strengthen the Public Health System to cope with threats of climate change, assessing potential health impact, review the coping capacity of the health care system, develop and implement adaptation strategies against climate change risks. Training and retaining health personnel, improve health literacy and ecological literacy.

This would involve strengthening primary health care, giving priority to neglected communicable diseases and addressing environmental diseases rampant in the tropics, ensuring nutrition and food security and sovereignity social determinants of health, water sanitation.

Health Security of the Vulnerable women, children, elderly, poor- dalit and adivasi communities should be given priority.

Enhance Capacity to Address Public Health Emergencies eg., Disasters and frequent, varied and severe epidemics with diseases, old and new.

It is very true that the eyes do not see what the mind does not know. Since Public Health impact of climate change is not even being taught and discussed in medical Colleges, the silence from the medical community is conspicuous.

Promote Health Development. Public health concerns must be kept in mind and safeguarded while making policy decisions related to other sector eg. Industrial Policy, Economic Policy and not let them be jeopardized by TRIPS plus bilateral and Free Trade agreement. Ensure the availability of essential medicines and their rational use; protect and use the flexibilities available in TRIPS regime.

Urban planning transport energy supply and use, food production land use, use of water resources. Priority to decreasing Green House Gases must be given.

Integrated Surveillance Project. Inter-disciplinary research on health protection from climate change is essentialfor a true assessment of public health implication of climate change in different sectors, as well as of impact of different interventions.

There is a need to study climate change impact on health in different ecozones

- plains
- foothills
- hills
- coastal areas

The Ministry of Health and Family Welfare needs to be involved in Health impact studies, together with the Ministry of Environment and Forests.

The Prime Ministers Council for Climate Change must ensure presence of public health and public interest oriented representations.The Prime Minister's Council for Climate Change has representatives from various ministries but conspicuous by its absence is the Health Ministry, whose presence to protect public health is needed.

Transfer of Technology

The other concern is about linking up transfer of technology for mitigating or decreasing adverse impact of climate change, with Intellectual Property Rights.

These monopoly central and high costs of technology transfer would create problem for those developing countries most in need, but with inadequate

resources to pay high costs for technologies to protect their people and allow themselves to be activated into accepting unjust conditionalities.

IPR regimes biased in favour of the technologically advanced countries this would also be affecting the access to medicines and vaccines badly required for the outbreaks of diseases as a consequence of climate change.

To protect public health, measures are needed to curtail "public health destructive" technologies and trade. In the midst of all that is being pushed globally, the rights of the poor marginalized, tribal, fisherfolk communities must be protected.

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7. Climate Change and Sustainability

Lawrence Surendra

"that which is common to the greatest number has the least care bestowed upon it ..... Everyone thinks chiefly of his own, hardly at all of the common interest, and only when he is himself concerned as an individual. For besides other considerations, everybody is more inclined to neglect the duty which he expects another to fulfill...

Aristotle, Politics and Poetics, bk II, ch.3

Introduction: Democracy in a Post-Climate Change world[1]

In looking at some of the challenges facing us especially in Asia in promoting inclusive democracy and the dilemma and contradictions of democracy, discussions on politics, economics and society loom large. But all human social, political and economic life is under girded by the fact that we live in a planetary ecosystem ruled by the rhythms and rules of nature. From a narrow minded nationalist ideological sense and in a anthropocentric perspective, we could go on believing that only our politics of nation state matters, but more than as a result of globalization, given the impact of climate change on the only earth we all commonly inhabit, we are all now more than even before connected in terms of our lives and futures. No nation can say that it can somehow manage to survive on its own[2]. This is no longer possible. We share a common responsibility for our common future. This is another fundamental paradigm shift in the nature of our existence and which calls for completely revisiting our notions of politics and democracy. Ecology and the absolute limits of the planetary ecosystem and its ability to absorb the impacts of human activity forces us to revisit all our politics. Equity, which hitherto has been seen as something normatively desirable, has become a prime requirement for ensuring that the human race can survive along with planet earth. War, inequality, affluence and its corollary excessive consumption all threaten the future of planet earth and by that the future of humankind itself. Ironically, climate change and the possible consequences of climate change for the very future of planet earth and human beings has brought to the centre stage not

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Lawrence Surendra, Chemical Engineer, Environmental and Developmental Economist

issues around the knowledge or science of climate change but issues of democracy both in a planetary sense and in an inter-generational sense.

Vaclav Havel, writing about the fundamental, moral, philosophical, ethical and political challenges we face as a result of climate change says, "Maybe we should start considering our sojourn on earth as a loan. There can be no doubt that for the past hundred years at least, Europe and the United States have been running up a debt, and now other parts of the world are following their example. Nature is issuing warnings that we must not only stop the debt from growing but start to pay it back. There is little point in asking whether we have borrowed too much or what would happen if we postponed the repayments. Anyone with a mortgage or a bank loan can easily imagine the answer".

He points out that, "We can't endlessly fool ourselves that nothing is wrong and that we can go on cheerfully pursuing our wasteful lifestyles, ignoring the climate threats and postponing a solution. Maybe there will be no major catastrophe in the coming years or decades. Who knows? But that doesn't relieve us of responsibility toward future generations". And goes on to write that, " I'm skeptical that a problem as complex as climate change can be solved by any single branch of science. Technological measures and regulations are important, but equally important is support for education, ecological training and ethics — a consciousness of the commonality of all living beings and an emphasis on shared responsibility. Either we will achieve an awareness of our place in the living and life-giving organism of our planet, or we will face the threat that our evolutionary journey may be set back thousands or even millions of years. That is why we must see this issue as a challenge to behave responsibly and not as a harbinger of the end of the world"[3].

Sustainable Economies or Sustainable Societies

In a chapter that attempts to look at issues related to sustainable economies and sustainable societies, I deliberately began with an Introduction that raises issues of democracy, ethics and the limits of technology in addressing the challenges of what I call "a post climate change world". In a world of changed and changing meanings of terms we took for granted in the past, one has to keep revisiting 'meanings' and 'definitions' and which again are value biased and not value free. Today when we talk of sustainable economies, it need not necessarily mean 'sustainable' in natural resources or ecological and environmental terms. It mostly means sustainable in terms of closed economic

cycles. Even with regard to addressing Climate Change, on the issue of "mitigation or adaptation" OR "mitigation and adaptation", the UNFCC actually does not have a clear definition of 'adaptation', but only notes in the Convention's objective (UNFCCC Article 2), the need to "...achieve [stabilization of greenhouse gas concentrations] within a time frame to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." So 'adaptation' becomes a means to "enable economic development to proceed in a sustainable manner." Here again, one must assume that "sustainable manner" refers to 'sustainable' from a natural resources and ecosystems perspective, though this cannot be taken for granted, given that much of the debate and negotiations around Climate Change is about "sustained economic growth" and "sustainable economic growth" are mostly from the perspective of "sustained growth". Obviously, we are dealing with widely differing meanings and outcomes. Then there are a whole range of issues relating to "cap and trade" regarding Climate Change that we may not be able to adequately address here, except for some broad statements on their actual viability as solutions in addressing Climate Change issues.

In this contribution here, we will try to address in brief a set of issues, more with a view to generate discussion and debate than deal with them in any sense of finality. They are:

- The climate crisis and technology
- The economic crisis
- Rural vs urban economies
- International governance, local livelihoods
- Ethics, rationality and the good life

The climate crisis and technology

There is now agreement amongst even sceptics and those trying to avoid facing the reality, that human induced climate change is affecting the earth's ecosystem and will one day result in pushing all living things on earth, including human beings to extinction. There is no doubt that temperatures caused mainly by the wastes gases of human activity, is pushing global temperatures up and causing increased unpredictability in weather events and resulting natural disasters. Ironically and simultaneously the debate about how to deal with the

effects of Climate Change while heating up, does not seem to go anywhere or want to go anywhere. This particularly with the 15th Conference of Parties of the United Nations Conference on Climate Change in Copenhagen in December 2009 not far away and hopes fading about agreements that would put a cap on temperature increases.

The IPPC has repeatedly stated in its Assessments Reports, that globally we must limit our CO_2 emissions, and move towards low carbon economies and lifestyles. To do this to and achieve a target of keeping global mean temperature increase to 2°C, requires without doubt global negotiations that can contribute to a new international agreement on combating climate change for the post 2012 period. Key to such agreement is how much nations are prepared by how much and within what period, to cut their CO_2 emissions. It is on this issue there seems to be two voices, that of nation states, in UN parlance called member states and on the other that of ordinary people, or citizens. Though, there are actually three voices, that of states, markets and society. In most cases, the voice of the state is also that of markets, which is why the state often resorts to "double-speak'. While claiming to talk for its citizens, the state often speaks only for business and corporate interests and their concerns.

Member states are negotiating, interestingly, for their quota or contribution of waste gases that can be accommodated in the global atmospheric commons, and trying to cut up the common property of the earth's ecosystem in a property rights discourse of nation states. Citizens are gradually waking up and saying, No! This earth and the atmospheric commons belong to all of humankind, we will either commit collective suicide through our non-cooperation or save earth and its inhabitants if we with wisdom can learn to cooperate and work together. It is as a result of such thinking that in countries like Britain, movements such as the 10-10 movement to cut carbon emissions by ten percent by 2010 are growing.

Discussions about 'technology' and technological solutions to climate change, need to be situated in this background between a property rights discourse on the environment and a commons approach to finding solutions to impending ecological disasters such as climate change. While acknowledging, that technology and technological changes could contribute their "mite" to addressing climate change, there are no and can be no technological or engineering solutions to the problems created by climate change. Looking to escape routes through technology is only postponing the inevitable. Other than

the fact that technological solutions, cannot undo the fact of a warming globe, it must also be remembered that as far as Technology is concerned, it is inherently part of the property rights systems of the world economy and cannot provide any lasting answers to what is basically a problem of the destruction of the global atmospheric commons. It is possible within a nation-state context, that there may be solutions attempted via the 'technology route' and which may provide new economic opportunities including employment but it remains that and nothing more.[4]

The economic crisis

The recent global economic crisis and the financial meltdown, was in the making for over two years and many saw it coming but very little was done to prevent it. The reason being that the very new instruments created for the growth of financial markets, the 'derivatives' and the 'collateralized debt obligations' brought the financial markets down. Banks, "peddled mortgages to people who could not possibly pay the monthly rates and then put this snake-oil debt into cardboard boxes with impressive labels and then sold them to institutions and hedge-funds that thought they were worth something".[5] The 'economic crisis has had its toll on people and jobs, but has also meant a small respite from the relentless war of attrition that the global economy was waging on the earth's resources[6]. The lessons from the 'economic crisis' however are not being learnt. Firstly and specifically, in relation to 'the carbon trading system' being sold as a centre-piece of (market-led) solutions to climate change, the lesson that the new commoditization of 'carbon credits' parallels the commoditization of debt that led to the global economic crisis is not being drawn. Larry Lohman, who does such good post-mortems of the trading systems for carbon has recently done an excellent work comparing the two, the commoditization of debt and the commoditization of carbon emission permits[7]. The second lesson not learnt, especially in countries like India was in missing the opportunity to use the financial stimulus programmes for directing public investments for creating assets in terms of sustainable development in sectors such as renewable energy, agriculture and small scale industrial sectors.

Rural vs urban economies

The major divide in India, a divide which periodically threatens taking the entire nation down, is the rural-urban divide. India's success as a nation will critically and crucially depend on addressing this divide. The recent spate of

Naxalite violence that has gripped continuous media attention, the response of the state using militaristic and cold war language to deal with it are all but symptoms of a deeper malaise affecting India as a nation. It is not as if official documents and analysis do not recognize this problem. The 11thPlan Document (2007-2012) dealing with Rural Development, begins its focus on rural areas in a section, titled, 'Rapid Poverty Reduction' and states, "India is nation with more than 300 million poor people, a number that has barely declined over the last three decades of development". Intertwined with the rural-urban divide is the extent of poverty in the rural areas. So ensuring livelihoods is central and the 11thPlan document recognizes the importance of the household based enterprises especially in rural areas in contributing to livelihood creation and the as "capital saving, labour-intensive, and environment friendly tools of inclusion".

Yet, very little of this vision leads to any meaningful, real and material transformation in the lives of people and ground realities in rural areas. While this overall depressing situations constitutes a key dimension exposing the failure of the development discourse in India, in the context of the challenges of climate change confronting India it now merits new attention, considering the hyprocritical manner in which the same poverty becomes a cover in Indian national discourses to evade genuine discussions on actions to deal with the impacts of climate change. What climate change observers, aptly term as, 'Hiding behind the poor'.

Everyone following the international discussions and processes to deal with climate change are very well aware that even if the Kyoto Protocol was to be fully observed it is not enough to stabilize climate change by 2100. IPCC projections are also clear that even if industrial countries' emissions are reduced to zero, this will still not help and developing country emissions will contribute to levels above the 550ppm stabilization level that is required. The principle of "common but differentiated responsibilities", the agreed UN standard for international negotiations, should be used internally within the country for addressing the rural-urban divide, which makes it possible for the rich and super-rich of India to continue with their "luxury emissions" because our poor and their non-emissions make it possible for them to continue irresponsibly with their "luxury emissions".

We have a situation of gross income disparities which current economic policies accentuate, creating scenarios of unequal energy access and use while

at the same using the persistence of poverty to justify the energy-inefficient ways of our rich. We need a system, of internal national accounting, similar to the one used in international discussions, to effect a transfer of resources from the urban areas to the rural areas and by targeting elite consumption. Civil society organizations, other than jumping onto international band wagons such as "ecological debt' and being part of such "debt" junkets, should do serious homework on the "mitigation" done by rural areas to offset urban emissions and work out even at Parliamentary Constituency level the offsets that rural constituencies provide for urban areas and quantify actual financial transfers to promote equity between the rural and urban areas. This should become part of inclusive democracy projects that parliamentarians can carry through and thus ensure that parliament discussions address core issues regarding equity in development. A sustained focus on sustainable rural development through transfer of resources from caps (through innovative taxes) on elite consumption should become part of our democratic discussions and functioning of democracy. This is the only way, the double-speak of both state and civil society regarding equity at the international level be addressed at the national level and ensure that intra-generational equity is key to addressing inter-generational equity and for which the rural poor must be at the centre. Only then can we hope to achieve internationally, the 450 ppm target and to do which the clamor (from both state and civil society) in international forums that it be apportioned based on equity between nations.

International governance, local livelihoods

The above discussion takes us directly to the question of international governance and local livelihoods, because as mentioned in the section above on rural-urban divide, we need to shift the terrain of discussions on burden sharing, from purely a nation-state centric approach to that of populations disaggregated in terms of their income, living standards and life styles between and within nations. This would require that country by country emission targets are not set only at the production end but at the consumption end and disaggregated in terms of income groups bringing the individual into the discourse and debate on climate change.

In terms of equity, it is clear that access to energy and energy services is crucial determinant in ensuring livelihoods. The international negotiations and debate should address this clearly and from a livelihood point of view rather than both developed and developing countries such as China and India fixated about

economic growth projections and demanding their share of emissions in the global atmospheric commons. "Grow first, distribute incomes later (or trickle down) and protect the environment after that", paradigm has become the basis for climate change negotiations. This deeply flawed approach can only be shifted by analyzing international governance issues be it economic governance (WTO, World Bank, IMF) or political (UN) or ecological (UNFCC for eg) from livelihood perspectives and ensuring "common but differentiated responsibilities" at both the international and national level. Funding mechanisms, technology transfer and capacity building would then have to be refashioned to address issues of energy access and services to specific marginalized populations and for improving energy access and services for rural areas, than blindly increase inefficient energy infrastructure for the multiplying energy demands of affluent urban populations. Demand side management of energy becomes for example a critical dimension of equity and could be one of the critical pathways to address climate change.

What has been referred to above are just some examples. On the one hand space does not permit us to go into a detailed discussion on the connection between international governance, local livelihoods and altering the climate balance in a burden sharing framework that is equitable between and within nations and on the other there already exists a large body of discussion from such perspectives. The duty of those involved and concerned about the direction in which national and international discussions on climate change are going, is to bring such discussions to the centre of international and national democratic debate.

Ethics, rationality and the good life -Radically redefining the politics of democracy.

"Responsibility towards future generations", "ecological ethics", "shared responsibility" and the challenge to behave responsibly" all make a profound demand to radically redefine the politics of democracy. The politics of nation states, tells us that to be a citizen in a democracy is: to vote in periodic elections and elect a new government; be part of the economic growth tread mill; pay your taxes to contribute to national public spending; save but more importantly spend; be a consumer since that contributes to economic growth. Matter of fact, governments and business start panicking when consumer spending slows down in any economy! But underlying all this we may ask, where is the prosperity that governments talk about especially when they ask people to vote

them to office. Is prosperity only about earning, spending and consuming? Whose prosperity, individual or that of society as a whole? Who should work for prosperity, government or citizens? Since somewhere prosperity is supposed to bring happiness though that is not talked about directly, does a prosperous economy bring happiness to all? Though we know in real life this does not or may not happen.

As a case in point, take the case of China. Has the all round prosperity of the Chinese economy brought happiness to all its people? Obviously not, if one goes by just official suicide figures. According to official estimates, 2,80,000 Chinese kill themselves. Supposedly the actual numbers could be even higher since many given the social stigma of suicide which symbolizes in a sense failure, would not want to publicly say that a family member committed suicide[8]. Can we conclude that rapid economic growth in China is not producing happy citizens? So if democratic politics is to be built anew, from scratch, after asking what does it mean to be a citizen, may be the next question to ask is 'what does it mean to be a happy citizen?' This question of 'happy citizen' is connected to the question of 'well-being', of asking of 'what is happiness?' or rather even 'why happiness?'

Social philosophers have held that human beings live in two states, one of doing and the other of being. It is the state of being that concerns human beings with welfare and happiness. It is this concern with welfare and happiness that has also driven human societies to continuously seek to organize life and work so that happiness and welfare can be achieved. Economic activity, work and income have played a great part in defining whether happiness has been achieved especially in modern industrial societies where economic growth is the driving force of societies. This growth is measured within nations often as a function of the total output of economic activity and called, GNP or Gross National Product. At the same time this growth has not produced a sense of wellbeing, of physical and environmental states of well being as well a confidence (security) in the future. It is this search for an overall sense of well being that has also generated the search for measuring states of well being and moving away from narrow GNP type of measures.

Happiness is not just a state of wellbeing but a state of well being arising out of a notion of contentment. To be contented and therefore happy. In this way to ensure that individual happiness does not stand in the way of and is an obstacle to larger societal wellbeing or the public good. A major contribution to the

discussion on wellbeing has been among others the contributions of Buddhist societies. Many Pacific island societies and indigenous communities the world over have also evolved concepts of well being and happiness and which are closely related to their local knowledge systems.

J.C.Kumarappa, the Gandhian economist, also known as Gandhi's economist grappled with the questions of well being and happiness which he saw conventional economics as not addressing. Kumarappa was known as Gandhi's economist, because of his close collaboration with Mahatma Gandhi to create parallel to Gandhi's political organizing, a economic theory that was consistent with Gandhi's principles of Non-Violence including Gandhi's propagation of a non-violent economy. Gandhi was a consistent critique of the industrial economy which Gandhi saw as breeding violence. It is in response to this that Kumarappa produced his famous work, known as 'The Economy of Permanence'. Modern economics has contributed very little to ecological sustainability or distributive justice, Gandhian economics and Kumarappa's work on 'The Economy of Permanence' tried to address these issues. One can say that 'The Economy of Permanence' of J.C.Kumarappa and Gandhi's own critique of the industrial economy five decades ago are important forerunners to the contemporary discussions on ecological sustainability and which is a pre-condition for the sustainability of democracy.

In refashioning a new politics of democracy at the level of planetary earth, we have to deeply reflect through the notions and the links between, democracy, citizenship, a happy citizen, happiness, well being and contentment. We need to do this through an entirely new process of Education for Democratic Citizenship. Education for Democratic Citizenship is a process through which societies change their ways of thinking about life, work and well-being and are able to link personal well-being with societal well-being and the sustainability of ecosystems and on which all human life is dependent. A radical Education for Democracy can re-establish the link between contentment and the importance of restraint not only as a moral choice but as being central to collective human survival. It is in this process we can usher in a new politics of democracy that can advance the idea of measuring development and progress in terms of well being. Contentment and Restraint as an individual choice as opposed to measuring progress only in terms of consumption and consumer choice and which puts at peril both societies and the planetary ecosystem. It is only through this difficult route, step by step retracing our politics of democracy can we secure a future of peace, equity and sustainability for all and

above all for our children and our grandchildren. The first step in retracing our politics is making democracy inclusive.

History has shown, that governments however good their intentions are cannot achieve any meaningful and desired objectives or change. At the heart of change has been, citizens. This is the case whether it is nationally or globally. Ask the women's movement, the environmental and ecological movement, the movements for workers rights, the list is endless. In all these movements for change, there has been a very important and key role for awareness building, knowledge and education. There is a tendency to dismiss such interventions as 'soft' while diplomacy, negotiations and treaty making are seen as 'hard'. Often where the State has failed, it is the people who have kept ecology, community and society together. We forget this only at our own peril.

References

[1]This Introduction is taken from Lawrence Surendra, 'Democratizing Democracy – Beyond representative p olitics to the politics of inclusion', in, 'State of Democracy- Oligarchic Democracies and Asian Democratization', Cho, Hee Yeon (et al) Edited, Korea Democracy Foundation, Seoul and Earthworm Books, Bombay, 2009.

[2]Speaking at the Brookings Institution in Washington DC, March, 2008, Kevin Rudd, Prime Minister of Australia, said: "I've said elsewhere this simple point, that there is now no longer a clinical divide between the national and the international, the foreign and the domestic, the internal, the external, as the great divide collapses. So much of what we do internationally is an extension of what we do nationally. And to be effective in what we now do domestically, we have to be in parallel terms active externally."

[3]Vaclav Havel, Our Moral Footprint, New York Times, Op-Ed, 27th September, 2007;

[4]There are whole lot of technologies, such as for example the Carbon Sequestration Technologies, initiated by prestigious organizations like MIT and which are supposed to be located in different parts of the world. " The Carbon Sequestration Initiative (CSI) is an industrial consortium formed to investigate carbon capture and storage technologies. The consortium began in July 2000. Currently there are eighteen sponsors: Alstom Power, American Electric Power, American Petroleum Institute, Babcock & Wilcox, Chevron, ConocoPhillips, ENEL, Entergy, EPRI, ExxonMobil, Marathon Oil Corporation, Peabody Energy, Sasol Technology, Schlumberger Carbon Services, Shell, Siemens Power Generation, Southern Company and Vattenfall" (ref:); This list of those involved in CSI for example tells us a lot.

[5]Margaret Atwood, Payback, Bloomsbury, 2009, quoted in Larry, Lohman, 'Uncertainty Markets and Carbon markets: Variations on Polanyian Themes', contribution to New Political Economy;

[6]According to a October, 2009 report of the International Energy Agency, the economic crisis led to a 3% fall in Carbon emissions;

[7]Larry, Lohman, 'Uncertainty Markets and Carbon markets: Variations on Polanyian Themes', contribution to New Political Economy; see also, Larry Lohman, 'Carbon Trading, A Critical Conversation on Climate Change, Privatisation and Power', Development Dialogue, No.48, September 2006,, Dag Hammarskjold Founadtion, Uppsala, Sweden.

[8]Ching Ni, Crusade Against Suicides. Los Angeles Time, May 2008

8. The Way Forward

Walter Mendoza

Climate Change is already happening, and is impacting communities in different eco-systems in ways that are not visible to those who live in the secluded, exclusive, dominant, metropolitan paradigm. It is clear that the impacts of climate change affect the most vulnerable: the marginalized majority of the world. The implications for India are enormous as about 60% of the population can be said to be marginalized.

These communities are rooted to their local environments and resources. The vagaries of rainfall and temperature affect the crops that are grown, and impact sustenance; impact water sources for domestic and livelihood use, leading to great scarcity; affect, to the detriment of local communities, the forests that provide a significant portion of nutrition, fuel, housing and income; and even affect the health of local communities in ways not known before.

Climate Change is increasingly being recognized as a development issue. Neither the infinite growth mantra, nor the technologically driven, finance driven paradigm will bring long-term sustainability. The issue before us is – what is the good life? How do you produce food, provide goods and services and sustain cultures that are nurturing and enhance well-being?

Today's Development Model contains two key elements:
One, the conception of the good life: growth, consumption, leisure, pleasure.
Two, the vehicle to deliver this good life: the corporation; it is given the status of an individual, with accompanying inalienable rights, limited liabilities and no responsibilities.

Walter Mendoza, Member - Indian Network on Ethics and Climate Change (INECC); Executive Director, Centre for Education and Documentation

The Hidden Hand

Behind the scenes, in climate negotiations unheard, unseen, and untouched; but silently pulling all the strings – are the corporations. This is how Al Gore, who led the US delegation to Kyoto in 1997, was shackled; these are the interests that took over the negotiations process, (silently, behind the scenes, hiding behind the skirts of democracy) post-Kyoto, through Marrakech to Nairobi, and made such a dirty business of the clean development mechanism, and stonewalled on technology and financial transfers.

And this is why, in the face of irrefutable evidence of the scale of the problem, and what needs to be done, the US (with Canada, and Australia hanging on to its coattails; and with Europe playing the good-cop, but actually toeing the US line) continues to stonewall on the required level of commitments to mitigation of GHGs.

If the corporations have their way, the UNFCCC will go the way of Iraq, and the bailout of banks in the aftermath of the financial meltdown. Right now we are treading down that path.

So, where do we go from here?

We undertake an uphill task, a herculean struggle. A *satyagraha.*

Immediately, there is Copenhagen ...

We support the Government of India in its stance in the international negotiations under the auspices of the UNFCCC (United Nations Framework Convention on Climate Change) that it is ethical and equitable that only Annexe I countries take on mandatory mitigation measures in the next post-Kyoto regime.

The key targets are 350 ppm & <2°C. The overall limit of Green House Gases (GHGs) in the atmosphere that are emitted due to human interventions should be 350 ppm (tCO_2e). This, we understand, could give us a chance to limit Global Warming to 2°C. This anyway leads to disasters. Any higher, and it will spell catastrophe.

While there is an agreement of sorts that this is what generally needs to be done, the devil is in the details – how do we go about getting this done.

The basic structure of the post-2012 UNFCCC Regime should remain the same as was thrashed out at Kyoto: Annexe 1 countries to take sole responsibility for mandatory emissions reduction but this time, without off-sets.

We affirm that Annexe 1 countries need to agree to a long-term mandated target of 90% GHG emissions reduction by 2050, with mid-term targets of 40% reduction by 2025; starting with meeting Kyoto objectives by 2015. The baseline should irrevocably remain 1990.

It is only this that can give us any semblance of hope to keep Warming down to tolerable levels.

A Green Technology Transfer Regime needs to be in place by 2015. An accelerated negotiations framework for this needs to be established at Copenhagen. This regime will be under UNFCCC auspices and will override the WTO framework.

An Adaptation Fund, with contributions averaging 0.7% of GDP from Annexe 1 countries, to be put in place from 2012. This regime will also be under UNFCCC auspices, and not with the IMF or World Bank and the like. This will be in addition to the ODA (Official Development Assistance) @ 0.7% of GDP that has been agreed to by the OECD and others in 1970.

Is this asking for the Earth? Yes, it is.

It is asking for the Earth to be available for everyone's need. Everyone's.

... and the NAPCC

India's per capita energy consumption is low because 70% of India's population still lives in rural areas; their growth and development needs will mean an exponential growth in demand for energy, even at basic sustenance levels.

It is not possible to integrate the development needs of the poor with a reduction of levels of emissions in the atmosphere, unless India adopts a low-carbon path to development, which takes into consideration the carrying capacity of the Earth.

Developing countries need to leapfrog to a low-carbon path. This implies, that these countries do not take the same misguided path that the Annexe I countries did, to the detriment of the rest of us. But for this to happen, National Plans need to be in place for this by 2015, with a focus on sustainability and equity. This is to be worked out in tandem with a renewed, radical Millenium Development Goals regime.

India can play a leadership role in advocating the development of a fair climate agenda in the global context that recognizes the issues of equity at the international, national, as well as local levels.

The NAPCC, India's National Action Plan on Climate Change, can become central to India's potential to leapfrog the fossil-fuel path, and jump on to the low carbon pathway. But there needs to be a radical change in the manner in which it is developed. The NAPCC, as has been formulated, is to be seen as a starting point.

In fact, it raises many more questions, than it provides direction:

- Is there a vision of sustainable development and a sense of urgency?
- Do the missions have a coherence and integration into a holistic action plan?
- Does it holistically look at all ecosytems?
- Is there an appreciation of grassroots capability and involvement?

The short and simple answer to most of these questions is No.

For instance, with a coastline running approximately 7500 km in length, this eco-system does not have a mission to relate to issues peculiar to it, eg., as basic as sea-level rise!

Obviously, there is much more work to be done.

This is what the Declaration, **Peoples' Voices in the Domestic and International Climate Change Agenda, November 7, 2008 at Visakhapatnam** *(Annexure 1 at the end of this book)*, said:

> *There is a need hence to intervene at various levels through engaging with the Government of India on NAPCC by critiquing the plan and the process of its*

formulation on the one hand, as well as providing inputs or an alternative action plan for a low 'carbon pathway' on the other.

It was recognised that the sectored approach of the plan was an obstacle to facilitating a holistic strategy in addressing the issue of Climate Change.

There is a need to ensure involvement of the highly aware communities and civil society at each stage of the processes of the NAPCC through a bottom up approach, without which no credible, effective and viable plan is possible.

As a first step, the current plan should be translated into the recognised languages and a copy should be provided to panchayats, seeking the inputs of the gram sabhas to the draft plan.

A credible, independent, inclusive process of hearing the people at block and district level should be instituted for seeking inputs from people.

The problem is no one in Government believes that this needs to be done. Even if they do, no one in Government believes that it can actually be done. And, even if it can be done, it is believed that there is no time to get something like this done. After all, India is a vast country, with so many states, languages and communities, and diverse states of 'backwardness'.

Let us not pick on the 'backwardness' issue for the moment. But it is precisely because there are so many states, diverse languages and communities, and we can add here so many eco-systems and sub-systems, that we need to integrate a bottom-up approach to the NAPCC, for it to have any relevance, for it to have any legitimacy, and most of all for it to have any chance of success.

While the past failures of our planning process can also, in great part, be attributed to this lacuna, there is another dimension to what we are demanding.

Just as the Government of India has taken an ethical and equity stance in the international negotiations under the auspices of the UNFCCC that it is ethical and equitable that only Annexe I countries take on mandatory mitigation measures in the next post-Kyoto regime, by the same yardstick, India needs to follow an ethical and equitable perspective in its domestic policies.

While there is a semblance of allusion to this in the preamble and in some of the statements of principle throughout the document (NAPCC), the major thrust of the Missions is business as usual; only for business!

Packing the Missions with bureaucrats, experts, consultants, business representatives, and the less-than- a- handful token civil society representatives does not make for a democratic process, and can never bring in the equity and ethical perspective. An ethical and equitable perspective can only come from the active involvement of the grassroots from the various eco-systems in the preparation of the NAPCC.

We preach so much in international fora, but we are loathe to practice it in our own backyard.

There is disbelief amongst those of us so addicted to oil and the conveniences that spurt and sprout from it, that while there is something to be said for the low-carbon life-style of the poor and the marginalized, it is a backward step - life cannot be lived thus.

As for 'backwardness', before we are inexorably forced into the backwardness of a 'post-industrial stone-age' *(Richard C. Duncan, 1996; http://dieoff.org/page125.htm)*, let us consider what representatives of these communities have to say in the same Declaration of November 2008 (Annexure 1) made in Visakhapatnam:

> ***The marginalised–not only victims, also creators of alternatives***
>
> *The traditionally-rooted communities, usually the marginalised rural communities, have preserved the environment for centuries and they continue to do so. Many countries in the North are now recognising and imbibing the traditional South-eastern wisdom in pursuit of sustainability, while we still seem to be treading the conventional path of destruction-based development. In any case, the poor hardly contribute to Climate Change, due to their low consumption lifestyles. The country needs to find ways of responding to the issues of the ecosystem communities because they are the first to suffer the ill-effects of Climate Change. For example, according to the IPCC 4th Assessment report, more than one million people will be affected by coastal erosion and land loss in India by 2050. Besides, various researches indicate that India's cereal production is expected to decline by 18% of the country's rain fed production in the future. Thus Climate Change is an issue of inequity which leads to food insecurity among the poor and crop uncertainty among the dry-land and other farmers. This insecurity is manifested in bio-diversity, water, food, livestock, energy, health, livelihood and threat to gender equity.*

The communities and many more civil society groups have therefore to be involved in the search for alternatives, with a focus on the poor and vulnerable groups. Adaptation to and mitigation of Climate Change is possible by preserving/protecting bio-diversity, forests, using agricultural waste for bio-fuels and through livestock improvement, organic farming better governance of electric power production and distribution, undertaking renewable decentralised energy options such as micro or 'nano' hydro, photovoltaic solar based home lighting systems and biomass based initiatives. In order to arrive at viable alternatives based on these imperatives, many participants shared their engagement in micro studies and projects at the grassroots level, because that is where adaption of the ill effects of Climate Change and mitigation for a new carbon pathway make the real difference. The participants commit themselves to strengthen their involvement in mainstreaming the adaptive mechanisms and further support search for mitigation processes.

There is no harking back to the past,
no going back to the traditional;
and, just making the West a scapegoat is not enough.

We need to understand what of the past and present we need to give up,
In order not to go backwards,
In order not to stay put and invite doom.

We need to go forward,
We need to understand what of the past and present presages a future,
In order to move forward.

In the longer term,
beyond Marx and Capitalism ...

Structural Change, which followed the Marxian principle of the oppressed overthrowing structures of power, and replacing them with the oppressed, in turn became oppressive and totalitarian. The intermediary structures of governance, management, and implementation remained hierarchical and oppressive in the long run.

In much of the South, variations of this model were practiced; as in India too.

The '90s saw us give up the idea of Revolution, of Structural Change, and many of us *adjusted* to the new realities - it was a time of loss of innocence, the loss of ideology; it was / is a time of working within the system, tinkering within the system; a time of creeping, incremental change; a euphemism for 'trickle-

down'. To borrow from triumphalist capitalist thinking and practice, this was Structural Adjustment

Climate Change and the Financial Meltdown are part of the triumphalist *hubris* before the fall - the end-game, when human beings get their come-uppance. But the basic issues have now come into bold relief:

- poverty is technology and finance gone haywire
- climate change is technology and finance gone haywire
- development (technology and finance) causes poverty and climate change
- poverty and climate change are issues of power and oppression

In the face of these issues, we need to go beyond Structural Change and Structural Adjustment.

... the Alternative is in Structural Transformation

Structural Transformation implies that the very structures that operate - economic, social, cultural, spiritual, technological, need to be transformed. Top down, bottom up, and sideways too. This is what gives meaning to the myriads of experiments, innovations at the grassroots. We have myriads of initiatives and experiments across the country, sub-continent, the world; they are isolated, random, dispersed. The moment we gain success, we are under pressure to scale-up, replicate, duplicate, homogenize, and then hegemonise.

For true structural transformation, we need to avoid these temptations. We need to patiently build up alternative structures of ***intermediary layers of autonomy***. This is the phase that we are faced with today: building up autonomous structures with layered roles and responsibilities in planning, finance, capacity development, technological innovation, organization, etc.

We need to focus on entitlements and capabilities of all communities – an inclusive transformation.

It is worth looking here at what we term Gandhism. Gandhi emphasized empowerment and the transformation of society; and the pursuit and practice of Social Change was imbued with political content. However, these initiatives

had none of the organizational characters to classify them as modern. Modernism, as represented by both Capitalism and its variants, and Marxism and its variants, has failed.

We must understand and appreciate Gandhi's prescience.

Economic, cultural, social, political and spiritual institutions that reflect the voices and power of the marginalized are a true test of Structural Transformation; and this is what Democracy is about.

Democracy is the answer to poverty and scarcity, democracy is giving voice and action to the marginalized. When decision making is far removed from the theatre of action, it is easy to make decisions that hurt what is not before you, what is not within your experience – people, communities, local resources and cultures.

This is the power of the Corporation – multinational, domestic, municipal, parliamentary, local assembly, or the *zilla parishad.*

We need a myriad, democratized, intermediary level institutions in structural transformation. In that sense, there cannot be an alternative paradigm – it belongs to the blueprint mentality.

To ask for one voice, one plan, one model is a travesty of democracy and diversity.

Structural Transformation is an independent, autonomous quest for alternatives; in today's world it is a subversive function – it is true *satyagraha.*

The focus of Civil Society

Civil Society operates at the tri-juncture of the top-down, bottom-up, sideways flow of information, policy formulation, decision making, resource allocation and programme implementation. At its innovative best, it is truly a part of the *satyagraha* movement.

It does not represent communities, nor does it necessarily speak on behalf of communities; yet it is a part of community.

Support the equity stance of the government of India in the international arena

At this point in time, the major role for Civil Society is to revisit the early days of the UNFCCC – COP process. Right up to the time of the adoption of the Kyoto Protocol, it played a key role in keeping the equity, justice and sustainability issues in the forefront of the Climate Negotiations. In the face of the overwhelming force of the Northern countries, it played the ethical card; moral force was a match for the financial and other resources that the corporations and related vested interests brought to bear on their respective governments from the North.

But there is a divide today – Northern NGOs, weakened by Structural Adjustment, seek to pressure Southern NGOs to challenge their Southern Governments to undertake commitments; unthinkable when the COP process was initiated. They seek to cajole southern Civil Society into putting pressure on Southern Governments to make concessions, 'to build trust' with Northern governments.

Build Trust with Northern governments?

Northern countries have completely abdicated responsibility for mandated emissions reduction already agreed upon! We need to strongly support the Government of India in its stance in the international negotiations on Climate Change.

Mindful of this pressure building up, Civil Society needs to collectively get involved to jog the collective conscience of the 'international community' – that the ecological space for carbon emissions has already been almost fully occupied by the Northern Countries. Equity and Justice demand that they take emergency measures to drastically reduce their occupation of this Common Space.

Demand Equity at home

This is where the Government of India needs to be challenged. While preaching equity abroad, it is not willing to practice it at home – domestically. If the poorer countries demanded a voice at the UNFCCC based on proportional occupation of ecological space, it is a natural corollary that the marginalized communities within India also have the same demand – they constitute the overwhelming majority of the country – 60-70%.

Governments by their very nature are very conservative – they conserve the interests of the holders of power, the possessors of resources. Using the language of empowerment and participation, it continues to serve the interests of those who have the resources and power.

Decentralised processes at all levels

We need to facilitate spaces for processes and institutions to develop at the intermediary level that reflect the voices and choices of the marginalized communities. Marginalised communities have the right to determine the direction and pace of their own development – whatever that might be. This is the centre piece of equity, sustainability and justice.

Translating this rhetoric into practice is a constant struggle.

It requires sharing information and knowledge in ways that are rooted in subaltern culture – mindful of issues related to content, language, medium, spread and comprehensive transparency.

This is concretely spelt out in the Declaration of November 2008 (Annexure 1) made in Visakhapatnam:

- *Creating awareness of the implications of the Climate Change issue with various target groups at various levels in urban and rural contexts;*
- *Undertaking advocacy initiatives at the national and international levels voicing the concerns of those most impacted and neglected by Climate Change;*
- *Engaging with the Government of India on NAPCC by critiquing the plan and the process of its formulation on the one hand, as well as providing inputs or an alternative action plan for a low 'carbon pathway' on the other. It was recognised that the sectored approach of the plan was an obstacle to facilitating a holistic strategy in addressing the issue of Climate Change. There is a need to ensure involvement of the highly aware communities and civil society at each stage of the processes of the NAPCC through a bottom up approach, without which no credible, effective and viable plan is possible. As a first step, the current plan should be translated into the recognised languages and a copy should be provided to panchayats, seeking the inputs of the gram sabhas to the draft plan. A credible, independent, inclusive process of hearing the people at block and district level should be instituted for seeking inputs from people;*

- *Developing materials and tools for Climate Change education especially in regional languages;*
- *Upscaling adaptive measures at the grassroots level based on experiences shared during the consultation;*
- *Upscaling energy efficiency initiatives and decentralised energy options at the grassroots level based on insights gained at the consultation;*
- *Network and collaborate with stakeholders across sectors including technical and policy related fields in search for effective solutions;*
- *And above all, safeguarding the ethical perspective in national and international advocacy initiatives.*

So, much more than just sharing information, it requires that the voices of the marginalized are not just reflected in the policy choices; people's voices need to be the policy of choice. It is here that the government fails – miserably; *it is not hiding behind the poor! It is hiding behind a caricature of democracy.*

It is here that Civil Society also has not covered itself with glory either. It is very easy to fall into paternalism, oppression and hegemony. In a sense civil society the whole spectrum: from mass based movements, to the yuppie 'new activist; from the *noveau* professionals to the old visionaries; from the small grassroots efforts to the national and international NGOs - all straddle two worlds, in one being with the victim, and in another being part oppressor. And nowhere is this truer than in the debate and action plans on Climate Change – most civil society actors, from among the whole range of actors, are part of the elite, and are firmly grounded there.

This need not wrack us with guilt. This is the human condition.

True *Satyagraha*

We can only repeat: translating rhetoric into practice is a constant struggle.

Let us recognize, we are all part of the problem
Let us with conviction, commitment and compassion
Be part of the Solution.

This is true *Satyagraha.*

Annexure I

Declaration: Peoples' Voices in the Domestic and International Climate Change Agenda, November 7, 2008

The Consultation on "Peoples' Voices in the Domestic and International Climate Change Agenda" was jointly organized by Indian Network on Ethics and Climate Change (INECC) and Forum for Collective Form of Cooperation (FCFC). Its 49 participants comprising scientists, engineers, academicians, researchers, entrepreneurs, NGO leaders and people's representatives from different parts of India deliberated on:

- the current realities of the phenomenon of Climate Change with particular reference to the ecosystem communities, adaptive and mitigative strategies at the grassroots level;
- the role of advocacy related to the National Action Plan on Climate Change (NAPCC); and
- the global and ethical perspectives.

For INECC the engagement with the Climate Change issue has been a long journey. INECC has been focusing on Climate Change impacts from an ethical perspective since the past 15 years. During these years INECC has interacted with social action groups, technical persons and official bodies like the government ministries in its efforts to present the grassroots perspective to the official decision makers. FCFC with its huge outreach through its partner networks has prioritised Climate Change as an emerging agenda. The present Consultation is a result of mutual core concern of INECC and FCFC related to climate justice.

The NAPCC

The Consultation examined the NAPCC in which the Government of India presents the challenges of a low carbon pathway through its eight missions in the national plan: Solar Mission, Mission for Enhanced Energy Efficiency, Mission on Sustainable Habitat, Water Mission, Mission for Sustaining the

Himalayan Ecosystem, Mission for a "Green India", Mission for Sustainable Agriculture and Mission on Strategic Knowledge for Climate Change. Yet it states unequivocally that this issue should not be in conflict with the objective of fast economic growth. The participants found this stand contradictory. While power and transport sectors account for around 40% of GHG emissions, these are the sectors to which the government is giving priority in the name of economic growth. The concept of economic growth, development and prosperity needs to be reviewed with a rationale long-term perspective. Climate Change is not yet one of the components of the environmental impact assessment (EIA). 687 mining projects and 316 Special Economic Zones (SEZs) and other projects like Coastal Corridors have been sanctioned without taking the impacts of Climate Change into account.

The NAPCC mentions biodiversity as a national priority but the government is planning to build at least 168 major dams in Northeast India, for example, which is one of the 25 mega biodiversity zones of the world. More than 80 major thermal power plants are being planned in the coastal areas which too are rich in biodiversity. These projects will cause massive destruction of bio-diversity: forests, rivers, ecosystems of tribal and other societies. Hence, there is a need for a critical response from civil society on the NAPCC.

The marginalised not only victims, also creators of alternatives

The traditionally-rooted communities, usually the marginalised rural communities, have preserved the environment for centuries and they continue to do so. Many countries in the North are now recognising and imbibing the traditional South-eastern wisdom in pursuit of sustainability, while we still seem to be treading the conventional path of destruction-based development. In any case, the poor hardly contribute to Climate Change, due to their low consumption lifestyles. The country needs to find ways of responding to the issues of the ecosystem communities because they are the first to suffer the ill-effects of Climate Change. For example, according to the IPCC 4th Assessment report, more than one million people will be affected by coastal erosion and land loss in India by 2050 . Besides, various researchers indicate that India's cereal production is expected to decline by 18% of the country's rain fed production in the future. Thus Climate Change is an issue of inequity which leads to food insecurity among the poor and crop uncertainty among the dry-land and other farmers. This insecurity is manifested in bio-diversity, water, food, livestock, energy, health, livelihood and threat to gender equity.

- The communities and many more civil society groups have therefore to be involved in the search for alternatives, with a focus on the poor and vulnerable groups. Adaptation to and mitigation of Climate Change is possible by preserving/protecting bio-diversity, forests, using agricultural waste for bio-fuels and through livestock improvement, organic farming better governance of electric power production and distribution, undertaking renewable decentralised energy options such as micro or 'nano' hydro, photovoltaic solar based home lighting systems and biomass based initiatives. In order to arrive at viable alternatives based on these imperatives, many participants shared their engagement in micro studies and projects at the grassroots level, because that is where adaption of the ill effects of Climate Change and mitigation for a new carbon pathway make the real difference. The participants commit themselves to strengthen their involvement in mainstreaming the adaptive mechanisms and further support search for mitigation processes.

Key Issues, Concerns and Suggestions to Government of India for Policy Action

Water

- Imminent need to increase ground water and to store water through aquifers and to protect rivers, dams, lakes, tanks etc;
- Focus on small projects rather than large inefficient hydro projects which involve massive displacement of the poor;
- System of rice intensification (SRI) is welcome and should be introduced in more areas and extended to beet and sugarcane;
- Need for a transparent, accountable governance structure especially in relation to dams and irrigation projects;
- Need to make optimum use of existing infrastructure taking relevant measures to reduce siltation of reservoirs and providing resources for proper upkeep and maintenance of water power infrastructure (with a participatory process, including Environment Impact Assessments [EIAs] in local languages and public hearings for all hydro projects above 500 KW).

Energy

- The integrated energy policy of the Government of India, based largely on current sources of energy: coal and petroleum, is inconsistent with the policy of reducing GHG emissions;
- In view of the huge potential available in our country, the energy security on a sustainable basis is feasible only if we base our energy policy largely on renewable and decentralised energy sources;
- A holistic look at meeting the legitimate demand for energy consisting of maximum possible energy efficiency, effective demand side management (DSM), optimum level of energy conservation and widespread use of renewable energy sources is essential for a sustainable future;
- Effective and mandatory participation of the local communities in all decisions regarding their overall needs should be a primary plank of our national energy policy;
- As long as our energy policy emulates the energy profligacy of the developed countries, which is based on consumerism, we cannot hope to meet the unabated energy needs of the burgeoning population.

Forests and Biodiversity

There is a need to protect biodiversity by:

- Installing water harvesting systems;
- Promoting seed banks, grain banks and community forests;
- Enforcing rigid regulations for harvesting of biomass;
- Strengthen various committees on: drinking water, seed bank, grain bank, and community forest and on monitoring of long term climatic changes.

In view of the dangers to biodiversity involved with the current Clean Development Mechanisms (CDMs) there is a need to:

- Review legal framework for implementation of CDM projects: CDM projects impact the land use pattern and also leads to loss of ownership and control of common property resources like community forests. Such initiatives are defeating the very purpose of CDMs as tool for ensuring sustainable development;

- Enforce tribal protective laws in the Scheduled Areas: Giant corporates are diverting food crops/ forest land for monoculture of fast growing trees like eucalyptus to earn carbon credits without sharing the benefits with the farmers;
- Empower local bodies: Mandatory requirement of local bodies like the gram sabhas and panchayats for clearing CDM projects in their areas.

Agriculture and Food Sovereignty

- Develop crop/plant materials resistant to adverse climatic situation;
- Repair and renovate water harvesting systems, promote crop insurance and other support mechanisms;
- Policy change required for promoting organic farming in lieu of farmers being bulldozed with subsidized HY/ HB variety, chemical fertilizers to promote the interest of the companies;
- Ensure budgetary allocations for adaptation measures after dialogue with farmers;
- Promote the huge potential for ethanol generation through bagasse to meet transportation and electricity demands;
- Bio fuels to be used primarily for local consumption;
- Identify appropriate adaptation measures and mechanisms in geo-specific areas.

The Ethical Dimension

The type of destruction caused by the phenomenon of Climate Change reflects the need to underscore the missing ethical dimension in Climate Change negotiations. Ethics, equity and burden sharing are the underlying principles on which the future negotiations should be based. In this context the participants felt the need not only to be advocates of equity but also recognise the paradigm shift in the current economic growth model that is required as well as address personal lifestyle contradictions. That requires questioning of the current development paradigm and consumerism. The concept of 'good life' and 'celebration' has to be re-interpreted from an ethical perspective. The middle and upper classes that tend to benefit from the present form of economic growth at the cost of further marginalising the poor have to consciously commit to a more positive and responsible lifestyle.

Neither uncontrolled growth nor the government-promoted intensive technologies holds solutions to long-term sustainability. The participants do not consider nuclear power a clean technology due to its 'unclean' production processes involving uranium mining and health hazards due to dumping of uranium waste. The search for a solution has to be in the direction of environmentally and socially conducive lifestyles, organic materials and green products.

Our Commitment

In this context the participants commit themselves to search for such democratic processes and alternatives often rooted in traditional wisdom, by taking into consideration the impacts of Climate Change on the marginalised urban and rural poor. There is an urgency to respond and the participants will join / promote the alternatives that the ecosystem communities are attempting to cope with and address Climate Change impacts at the local level.

There is a need hence to intervene at various levels through:

- *Creating awareness of the implications of the Climate Change issue with various target groups at various levels in urban and rural contexts;*
- *Undertaking advocacy initiatives at the national and international levels voicing the concerns of those most impacted and neglected by Climate Change;*
- *Engaging with the Government of India on NAPCC by critiquing the plan and the process of its formulation on the one hand, as well as providing inputs or an alternative action plan for a low 'carbon pathway' on the other. It was recognised that the sectored approach of the plan was an obstacle to facilitating a holistic strategy in addressing the issue of Climate Change. There is a need to ensure involvement of the highly aware communities and civil society at each stage of the processes of the NAPCC through a bottom up approach, without which no credible, effective and viable plan is possible. As a first step, the current plan should be translated into the recognised languages and a copy should be provided to panchayats, seeking the inputs of the gram sabhas to the draft plan. A credible, independent, inclusive process of hearing the people at block and district level should be instituted for seeking inputs from people;*
- *Developing materials and tools for Climate Change education especially in regional languages;*

- *Upscaling adaptive measures at the grassroots level based on experiences shared during the consultation;*
- *Upscaling energy efficiency initiatives and decentralised energy options at the grassroots level based on insights gained at the consultation;*
- *Network and collaborate with stakeholders across sectors including technical and policy related fields in search for effective solutions;*
- *Mobilising resources by effectively ensuring 'carbon credits' to communities and their institutions;*
- *And above all, safeguarding the ethical perspective in national and international advocacy initiatives.*

Annexure II

October 14, 2009

To,
The Prime Minister of India
No. 7, Race Course Road,
New Delhi 110 001

Sub: National Action Plan on Climate Change (NAPCC) and the National Water Mission

Respected Sir,

In finalizing the India's National Action Plan on Climate Change (NAPCC) and the various missions, we would like you to instruct the advisory committee to delve into some of concerns and initiate a wide-spread participatory process to take the National Water Mission ahead. We are also pointing some general concerns about the NAPCC for your kind consideration.

The water sector

Some important recommendations in this sector include the following.

- **Participatory process for NWM** As noted above the NWM proposed as of now has been formulated through a completely non participatory and non transparent process. A time bound, participatory process for formulation of National Water Mission, National Mission for Sustainable Agriculture and other missions should be taken up immediately. Credible panels can be set up for taking up this exercise.

- **Approach** The approach towards water must not be a purely supply side response, in any case not through more large projects. Equity and access to water for all through rights based regime and democratic, bottom up, management must be a central plank for any plans.

- **Knowledge Base** Our knowledge base on the issue of impacts of climate change on water sector is poor. Immediately, we need to come out with a report on the state of the knowledge in this sector and we need to have annual updates of this report. There is also a need to have comprehensive, credible assessment of basin wide potential of water resources development through watershed development, groundwater recharge, local water systems. Such systems are efficient in harvesting rainwater, in ensuring groundwater recharge and are in fact more appropriate from employment generation point of view. Such an assessment does not exist for any basin, it can be started with say Ken and Betwa rivers basins. In the context of climate change, such options should have top priority.

- **National Water Policy** Suitable changes must be made to the National Water Policy. For the formulation of a new NWP, a detailed participatory exercise should be started immediately. The NAPCC recommends such review only in consultation with states, but this has to be a bottom up, participatory process.

- **Opportunity to reverse wrong policies** The climate change has provided us a unique, once in a century kind of opportunity to assess, review, reflect on our current policies and reverse them where we have gone wrong. This opportunity must not be allowed to go waste. We have a water crisis on our hands even without the climate change, with vast populations still not able to get water for basic human existence. More areas are slipping into problem zones as we are not able to ensure source sustainability, because of the wrong kind of priorities we have been following in water sector.

- **A National Water Security Act** is urgently needed from three perspectives: Human Right perspective, including health perspective, ensuring provision of clean water required for drinking and domestic water use for all as a right; from the livelihood perspective, ensuring the water required for livelihood for all and from the ecologic perspective, ensuring protection of rivers, wetlands, lakes, water bodies, etc.

- **Common Property Resource** Water is essentially common property resource, the state, where it has a role, is supposed to act as a trustee of this resource, in the interest of the people's basic needs, in a democratic manner, which is not the situation today. The proposition in NAPCC and NWM proposal for developing "new regulatory structures, combined with

appropriate entitlements and pricing" and also the urban water regime seem more like a push towards privatization of water resources, which is not helpful, appropriate or acceptable.

- **Reservoir Operation Committees** To ensure proper and optimum functioning of the existing and under construction reservoirs in the interest of the people, each reservoir should have a reservoir operation committee, in which at least 50% members should come from the local communities. As a first step in this direction, the reservoir operation rules and actual reservoir operation details (inflows, outflows, levels, capacities, and anticipated inflows) should all be made public *suo moto* on daily basis for each large dam in India.

- **Irrigation Efficiency** The objective of increasing the irrigation efficacy is much needed and laudable, but such attempts in the past has not succeeded because of the top down, unaccountable governance systems. Such attempts have left the governance of the larger systems outside the reach of the water users. Unless this is changed fundamentally, such attempts won't succeed.

- **Groundwater** is India's national water lifeline and will remain so for many years to come for all sorts of water use. If we want to ensure sustainable existence of this lifeline, we need work on three fronts: Firstly, ensure the sustenance of the existing groundwater recharge systems including local water systems & their catchments, wetlands and rivers; secondly, give top priority to creation of more such systems and thirdly, put in place credible, legally enforceable community led regulation.

- **Rivers, wetlands and water bodies** Indian culture and religions are supposed to value Rivers, but our governance system has no value for rivers flowing with freshwater all round the year. To bridge this serious lacuna, we need a law for ensuring that perennial rivers have freshwater flow all round the year, sufficient for various purposes including groundwater recharge, social and environment needs. Similarly we need law for protection of wetlands, water bodies and catchment of water bodies. We also need to declare some of the river/ tributaries in each state as NO GO zones, where no dams/ barrages/ hydropower projects are allowed.

- **Local water systems** are efficient in harvesting rainwater, in ensuring groundwater recharge and are in fact more appropriate from employment generation point of view. Such systems, through examples like Hirwe Bazar in Maharashtra, Laporia in Rajasthan and numerous other places, have shown that they are the best adaptation measures even in the climate change context.

- **Organic farming practices** must be incentivised, chemicals based farming dis-incentivised. Increased organic matter in soil will also increase the water security for the rain-fed farmers, since it will help increase the moisture holding capacity of the soils, in addition to having mitigation effect from climate perspective. Water saving, high yielding and low input requiring practices like the System of Rice Intensification should be taken up in right earnest at all the appropriate locations, including North West India. **In fact, SRI can be of immense help in the current situation of uncertain monsoon rains as it would help spread the limited irrigation water over long distances, reduce the crop maturing period and reduce seed requirements by upto 90%.** Water intensive crops and cropping methods should be discouraged.

- **Urban areas** Big cities are increasing going farther and farther away for tapping water resources for its seemingly insatiable thirst. This is not sustainable, equitable or climate friendly. Cities must be made to use its available local sources, including rainwater, local water bodies and groundwater in a sustainable way, the waste water must be treated to recyclable level and a cap must be put on how much water they can get. The massive Renuka dam on Giri River in Himachal Pradesh, being proposed for the water requirement of Delhi, is an example of inappropriate water project for an already water rich city. For example, the Planning Commission document *Integrated Water Management Policy and Actions* dated May 2009 says, "Delhi, for instance, has more water per capita than Paris."

- **Decentralised waste water treatment** Decentralized waster water treatment facilities should be the norm. The decentralized systems would also be less energy intensive, less cost intensive, more efficient and is actually likely to lead to more recycling of the treated water.

- **CDM Projects:** Most projects that have entered the CDM (Clean Development Mechanism) projects pipeline from India can not be

described as part of sustainable development, nor do they deserve CDM credits. We need to make the process of certifying such projects transparent, accountable, participatory and credible. Moreover, at least 75% of the credits from the credibly certified projects should go to local community development projects.

- **Priority for Maintenance of existing infrastructure** Make available adequate funds in the budget as a first priority to maintain the existing water related infrastructure before spending money on new schemes. For example, there is a need to ensure that water bodies, reservoirs and canals do not get silted up and therefore there is a need to make adequate investments for catchment area treatment of existing large, medium and small dams and also for regular desilting of canals and smaller systems. Similarly maintenance of the canal infrastructure to ensure optimum use of created infrastructure should be given a top priority. To ensure that all this actually gets done in a transparent and accountable way, the governance in water sector will have to be changed so that the local people have decisive say in planning, decision making, implementation and operation of the systems.

- **Weeding out unviable ongoing projects** There are a very large number of ongoing big irrigation projects, many of them are non viable or amounting to zero sum game as the basins or sub basins where they are situated are already over exploited. They are a drain on the economy & there is a need for a credible, independent process to ensure that unviable & undesirable projects may be weeded out or scaled down appropriately.

Some of the other overarching concerns

- **Governance**

The fundamental problem plaguing this sector is lack of democratic governance. We urgently need to set up legal and institutional mechanisms to ensure bottom up, participatory, accountable governance for rivers, for pollution control, river action plans, for groundwater, for environment management, irrigation systems, lakes, rivers, wetlands, embankments, canals, pipelines, and other related water infrastructure. Such project/river specific committees

should be statutory bodies with powers to make necessary mandatory orders with respect to the functioning of the projects.

- **Lack of integration across NAPCC**

  There is no attempt to ensure cross-sectoral integration across the various parts of NAPCC, missions and development path. Thus while the mission for Himalayan ecosystem talks about the vulnerability of millions in mountain environs, the ongoing and proposed initiatives on hydropower projects and the infrastructure that comes along with it is not only threatening the lives and livelihoods of these people, it is also hastening the process of glacier melt through direct impacts, through change in climate in the mountains and also through some local positive feedback mechanisms. Similarly, the initiatives on thermal power projects and mining (including coal, bauxite) proposals are threatening the water resources at numerous sites. The inappropriately undertaken massive agenda of road construction in mountains is cutting of local water streams, which are local people's lifeline. Inappropriate mining is destroying both surface and groundwater. There are no policies for appropriate citing of industries, considering the situation of land, water, forests, climate implications and so on.

- **Mainstreaming Climate Change**

  The environment impact assessment and decision making process of the water reservoirs in India should include an assessment of the possible impact of climate change on such projects and also the possible contribution of such projects to climate change, including the assessment of methane emission from such projects. On this last issue, India should take up a study of methane emission from existing reservoirs. In the decision making process, relative carbon footprint of different water options should also be an issue of consideration. Our EIAs are notorious for numerous fundamental failures, including blatant plagirarism, falsehoods, and inaccuracies. Firstly, the EIAs must be made available to local people in their languages. Secondly, all large dams, irrigation projects, flood management

projects, hydro projects above 500 KW must go through the EIA and public hearing process.

- **Going beyond the Limited solutions**

  All the solutions offered across the world so far suffer from the limitation in that they do not advocate reduction in consumption. They all seem to suggest the current consumption levels and even further growth in the same is possible to be sustained by various measures, including improving efficiency, shifting to renewable sources of energy and electricity and by adopting some new technologies. However, can the earth's environment sustain this if all the people of the earth were to aspire for the level of consumption now being used by the US and Western Europe?

- **Are we doing to our poor what the Developed World does to us?**

  The Indian government rightly says that they have no obligation to reduce GHG emissions, following the 'common but differentiated responsibility' as described in the United Nations Framework Convention on Climate Change. The question is, why should the same principles of common but differentiated responsibility and equity not be followed within India?

  Within India, the worst sufferers are the most vulnerable sections depending on the natural resources for their daily needs, including the *adivasis*, the coastal communities, the mountain communities, the rainfed farmers, the land less and the marginal and small farmers, the *dalits*, the women and the poor. Indeed they bring to notice a way of living with very little footprint and infact possible clues for reversal. It is in the name of development of these people that Indian government is arguing that we need to be allowed to increase emissions. The trouble, Sir, is that these people are not participant selecting the development options. Nor are these people benefiting from most of the mega projects of development. On the contrary, they are suffering further deprivations of their meager resources. If the development of these sections, including providing access to

electricity to them is the objective, then there are options available that does not require India to continue to increase emissions.

We would be happy to meet you to explain this further, if necessary. Thanking you for your attention, we look forward to your detailed response.

Yours Sincerely,

Indian Network On Ethics And Climate Change (INECC)
Forum For Collective Forms Of Cooperation (FCFC)
Oxfam India
Wada Na Todo Abhiyan
Centre for Education And Communication (CEC)
and endorsed by a Civil Society Coalition on Climate Justice and Equitable Development

Democratising Debate and Action Plans on Climate Change

India can play a leadership role in advocating the development of a fair climate agenda in the global context that recognizes the issues of equity at the international, national, as well as local levels.

It is not possible to integrate the development needs of the poor with a reduction of levels of emissions in the atmosphere, unless India adopts a low-carbon path to development, which takes into consideration the carrying capacity of the Earth.

This can only happen if the perspective of marginalised communities makes an impact on the Government of India, and it is coerced: to take bold, innovative and equitable action through public policy; and to translate the rhetoric of equity and inclusion of marginalised communities into concrete time bound programmes through the National Action Plan on Climate Change (NAPCC).

Four crucial missions in the NAPCC relate to energy, water resources, agriculture and forests. This book is an attempt to bring the perspective of the marginalised communities to these missions, as well as on the health sector and on governance issues in the sustainability debate.

INECC

Rs 190 / € 9